ENGINEERING NEWS

Tribune Building. New York City.

GEO. H. FROST, PROPRIETOR.

SATURDAY, FEBRUARY 26, 1881.

THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS held their eleventh annual meeting at Young's Hotel, Boston, Mass., on the 16th, 17th and 18th insts. There was a very large attendance, and the sessions were occupied in the discussion of the technical and practical matters of gas manufacture. Mr. W. A. Stedman, of Newport, R. I., was re-elected president, and Mr. George B. Neal, of Charlestown, Mass., secretary and treasurer. The American Gas-Light Association, comprising managers from all parts of the country, meets in Boston in October.

SOME engineers are foolhardy, or at least, do not give sufficient margin for contingencies, but it is possible for accidents to happen to even the "best laid plans." The Solway Viaduct was constructed by an engineer who was notorious for working out his problems in his own way, for a knowledge of iron work and a general carefulness. But the masses of ice which have been floating in the Solway Firth overcame the resistance of several of his piers, and thus the "margin" has been more than covered.

THE REMOVAL OF SNOW in large cities is a problem which a hard winter and a negligent street department will bring to the notice of the public. But the matter is not so easily dealt with as might be supposed. The surveyor to the parish of St. George's, Hanover Square, London, has given a reply to a "complaining" board. He says that he had all the men in the employment of the parish, and as many extra men as could be obtained, employed day and night in clearing away from the centre of the thoroughfares and clearing the channels, gullies and crossings. Relays of 250 men and horses were employed, but "notwithstanding all this, only 1,800 cartloads—equal to about 4,500 cubic yards of snow—could be removed daily. The great difficulty is the absence of places conveniently situated for the ultimate disposal of the snow." The engineer then goes into a few facts. There are 1,000,000 square yards in the parish. The snow, including that from the roofs, amounts to 400,000 cubic yards. To remove this in ten days would require 4,000 horses and men every day. It would cost $175,000—or just six pence to the pound to the taxpayers.

THE RENSSELAER POLYTECHNIC INSTITUTE.

The Rensselaer Polytechnic Institute is, we believe, the only exclusively civil engineering school in this country. There is a department of engineering attached to numerous American colleges, from which many well trained young men are annually graduated, but we can hardly expect to find these so well equipped in every branch of the profession as they would be if they were surrounded for the four years course only by an atmosphere completely, rather than partially, surcharged with the influences of an exclusive system of instruction such as would naturally prevail at the Troy school. The Institute was founded in 1824 as a *School of Theoretical and Practical Science*; it was incorporated by the State of New York ten years later, and at the end of its first quarter century of existence, was reorganized upon the larger basis of a General Polytechnical Institute. Its faculty and instructors now number sixteen, and its course of study, although arranged expressly for students in civil engineering, yet is believed to be well adapted to the wants of those who are desirous to receive the thorough discipline furnished by the careful study of the mathematical, physical and natural sciences. This course is intended to secure to all graduates a professional preparation at once thorough and practical, for the following specialties of engineering practice:

The location, construction and superintendence of public works, as railways, canals, water works, etc.; the design, construction and management of mills, iron works, steel works, chemical works and pneumatic works; the design and construction of roofs, arch bridges, girder bridges and suspension bridges; the survey and superintendence of mines; the design, construction and use of wind motors, hydraulic motors, air engines and the various kinds of steam engines; the design, construction and use of machines in general, and the determination of their efficiency; the survey of rivers, lakes and harbors and the direction of their improvements; the determination of latitude, longitude, time and the meridian in geographical explorations, or for other purposes, together with the projection of maps; the selection and test of materials used in construction; the construction of the various kinds of geometrical and topographical drawings.

In reading over this very comprehensive and practical course of studies, one cannot fail to realize its value to the young civil engineer who has successfully mastered it, and, diploma in hand, goes forth to measure his strength with his fellow professionals. A man of a mathematical turn of mind, and possessed of practical ability and quick perceptions may accomplish successfully a great deal in the preliminary work of surveying, and afterward in the construction of engineering work. The majority of engineers thus far have not been overstocked with too much theory. But the time comes when the limited education and the practical ability are able to go no further with safety, and it is then that the educated engineer comes to the front. He knows the principles, and he alone can devise the best methods of putting them in practice. The value of such men is soon found out and appreciated, and thus it is that from the long list of graduates from the Troy school we find so large a proportion occupying positions of great trust and responsibility, and that in all works of importance its graduates are preferred above all others. The register of the graduates from the class of 1826 to that of 1880 is one of which any institution might be proud; and it is to be hoped that in succeeding years the meetings, of which the reunion at Mr. Potter's was the experimental one, will develop new interest with each year, and so in turn establish that *esprit du corps* which ought to prevail throughout the entire profession.

The Institute Building, of which we present an accompanying illustration, is a substantial and imposing structure 115 feet long by 50 wide, and four stories in height. There is also the Winslow Laboratory, 60 feet long by 40 feet wide, three stories high, and the Williams Proudfit Observatory, 76 feet long by 60 feet broad, but which is yet without instruments. The Institute has a fine Cabinet of Natural History, etc., an excellent scientific library and a very complete collection of apparatus, instruments and models for illustrating the lectures in engineering.

The Institute has no endowment fund from which to draw, and it is to be hoped that, with an increase of interest for their Alma Mater among the many wealthy graduates who have studied within its walls, some efforts toward this desirable end will yet be made, and an institution which may very justly claim to be the best school of practical science in the country thus be enabled to enlarge its field of usefulness, and to do still more for the noble profession to which it is exclusively devoted.

PERSONAL.

Railroad Commissioner A. D. Briggs died in Springfield, Mass., an the 20th, aged sixty-one years. He had been twice mayor of Springfield.

Mr. Charles Hatch, general manager of the Minnesota & St. Louis railroad, has resigned to accept the position of General Superintendent of the Chicago, St. Paul & Omaha road.

John W. Young, the second and favorite son of Brigham, who was arrested for bigamy in Denver on the 15th inst., employs 600 teams and 1,000 men constructing a 100 mile section of the Atlantic & Pacific Railroad west from Albuquerque, N. M.

Jörgen Dahll, C. E., a young and talented Norwegian civil engineer, who has been investigating engineering works of note in America for the past two years, has recently returned from Oregon, and after a short stay in New York has gone to Providence, R. I., where he is looking into the merits of certain machinery with a view of introducing it in Norway. Mr. Dahll's address is 10 Hopkins st., Providence, R. I.

The officials at West Point have taken in hand a movement for the erection of a statue there in honor of General Sylvanus Thayer, who was one of the founders of the Military Academy. General Thayer became a lieutenant of engineers in the army in 1808. By 1838 he had become a lieutenant-colonel, and in 1863 a colonel, when he was retired. He received the brevet rank of brigadier-general in 1865, and died in 1872. The statue will be of granite, heroic size, and will be executed by Mr. Conrad.

Recent Mexican news announces the death, in the City of Mexico, on Jan. 27, of Senor Don Manuel Orozco y Berra, one of the most accomplished philologists and historians of Mexico. Senor Orozco was a leading member of the Mexican Ethnographical and Geographical Society, and his monographs on the Indian languages and dialects of Mexico have made his name well known to scholars in this country and in Europe. He was a man of fine literary taste and general erudition, and his death, in about the seventieth year of his age, will be a serious loss to the society, as well as to the literature of Mexico.

Lieutenant-Commander F. M. Greene, who is to have charge of the expedition to Asia to determine certain longitudes through China, Japan and the Russian possessions, has arranged to leave in about a month. He will go across the Continent and sail from San Francisco. The instruments for the use of the expedition have already been forwarded by way of Europe, English shippers having agreed to take them for $23 per ton and to exercise special care in handling them. It had been intended to send them by way of Panama, but the rates asked were $50 per ton, the shipper to take all risks of breakage. Two members of the expedition are naturalists, who will gather minerals, birds and insects, and make other curious collections for the new National Museum.

CORRESPONDENCE.

J. C., SCHOOL OF MINES, GOLDEN, COL.—Mr. Oates paper on the "Utilization of the Tides," read before the Liverpool Engineering Society, is out of print. From information received it is probable that the value of the paper is so inconsiderable that it will not be printed.

HISTORY OF AMERICAN WATER-WORKS.

THE CITY OF CHARLESTON WATER-WORKS COMPANY, CHARLESTON, S. C., Feb. 16, 1881.

EDITOR ENGINEERING NEWS:

Please place the water-works of Charleston, S. C., among the *private* enterprises.

I look forward with great interest to the pro-

posed articles on the History and Statistics of American Water-Works, and will take pleasure in forwarding to you any desired information about ours, as soon as I ascertain the nature of the data required. Our works are of very recent date, having only been in operation since July, 1880.

Yours, truly,

Zimmerman Davis, Secretary.

HISTORY OF AMERICAN WATER-WORKS.

Springfield, Mass., Feb. 16, 1881.

Editor Engineering News:

Dear Sir: In your issue of Feb. 12, in which you publish a list of water-works in United States and Canadas, we notice the following errors: In Massachusetts list, Amherst, Hingham, Nantucket, West Springfield and Orange are private corporations. Newburyport, Quincy and Watertown have no water-works. South Hadley should read South Hadley Falls; also, the following towns should be added to the list: Agawam, Mass.; Plymouth, N. H.; Chateaugay, N. Y., which are private corporations.

We think that if a list should be compiled giving number miles of piping, gravity or pumping cost of works, yearly income of same, etc., etc., it would be a valuable document.

Very respectfully yours,

Goodhue & Birnie,
Contractors for Water-works.

Atchison Water Company,
Atchison, Kansas, Feb. 18, 1881.

Editor Engineering News:

I have this day sent you a newspaper description of our works, which is about all the information we can at present give you for your History of American Water-works, as we only commenced supplying in December last. The paper also gives a good description of the city. In Mr. Prince's list of works I notice we have been overlooked. Your papers cannot fail of being valuable to all interested in the business, and we wish you success in your undertaking.

Very truly yours,

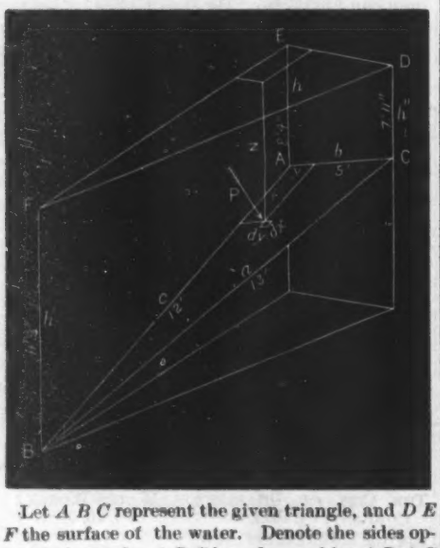
J. B. Quigley, Superintendent.

"HYDROSTATICAL PROBLEM."

Editor Engineering News:

I send the following solution of "Hydraulicus'" hydrostatic problem proposed in your issue of Nov. 6, 1880.

It is not necessary to repeat the problem, as the accompanying figure will show the data.



Let $A\ B\ C$ represent the given triangle, and $D\ E\ F$ the surface of the water. Denote the sides opposite the angles $A\ B\ C$ by $a\ b\ c$, and let $A\ B\ A\ C$ be taken as the axis of co-ordinates; rectangular, since the triangle is right angled. Denote the depth at which the vertex of the triangle opposite the greater side is immersed by h, that opposite the shorter side by h', and that opposite the remaining side by h'', and also by z the depth of any element of the surface of the triangle.

The equation of the depth at which any point of the line $A\ B$ is immersed, is evidently

$$z = h + \left(\frac{h' - h}{c}\right) x;$$

and that of any point of the line $A\ C$,

$$z = h - \left(\frac{h - h''}{b}\right) y;$$

whence, the equation of the depth of any point of the surface of the triangle below the surface of the fluid is

$$z = h + \left(\frac{h' - h}{c}\right) x - \left(\frac{h - h''}{b}\right) y \quad \ldots\ldots(1)$$

Let $dx\ dy$ denote the area of any element of the surface of the triangle, and w the weight of unity of volume of the fluid. Then, since the intensity of the pressure, p (which is perpendicular to the plane of the triangle), upon the element $dx\ dy$, is proportional to the depth z of that element, we have the pressure upon it

$$p = w\, z\, dx\, dy \quad \ldots\ldots(2)$$

its moment m with reference to the line $A\ C$, is

$$m = w\, z\, x\, dx\, dy,$$

and for the entire surface the moment m becomes

$$M = w \int\int z\, x\, dx\, dy \quad \ldots\ldots(3)$$

The resultant, or entire pressure upon the triangle is

$$P = w \int\int z\, dx\, dy \quad \ldots\ldots(4)$$

Then if x_0 denote the distance of the center of pressure, or the point of application from the line $A\ C$, the moment of the resultant, or entire pressure P is

$$P x_0 = w \int\int z\, dx\, dy\, x_0 \quad \ldots\ldots(5)$$

and by equating (3) and (5)

$$w \int\int z\, d\, x\, d\, y\, x_0 = w \int\int z\, x\, d\, x\, d\, y,$$

Hence,

$$x_0 = \frac{\int\int z\, x\, dx\, dy}{\int\int z\, dx\, dy} \quad \ldots\ldots(6)$$

If in like manner, we take moments with reference to the line $A\ B$, and denote the distance of the center of pressure from the line $A\ B$ by y_0, we have

$$w \int\int z\, dx\, dy\, y_0 = w \int\int z\, y\, dx\, dy,$$

Hence,

$$y_0 = \frac{\int\int z\, y\, dx\, dy}{\int\int z\, dx\, dy} \quad \ldots\ldots(7)$$

The formulæ (6) and (7) are general, and if we substitute for z its value in terms of x and y, as given in (1), and integrate (6) between the limits $x = o$, $x = c$, $y = o$, and $y = b - \frac{b}{c} x$, and (7) between the limits $y = o$, $y = b$, $x = o$, and $x = c - \frac{c}{b} y$, we have

$$x_0 = \frac{\int\int \left[h + \left(\frac{h' - h}{c}\right) x - \left(\frac{h - h''}{b}\right) y\right] x\, dx\, dy}{\int\int \left[h + \left(\frac{h' - h}{c}\right) x - \left(\frac{h - h''}{b}\right) y\right] dx\, dy} = \left\{\frac{h + 2h' + h''}{4(h + h' + h'')}\right\} c \quad \ldots\ldots(8)$$

$$y_0 = \frac{\int\int \left[h + \left(\frac{h' - h}{c}\right) x - \left(\frac{h - h''}{b}\right) y\right] y\, d\, x\, d\, y}{\int\int \left[h + \left(\frac{h' - h}{c}\right) x - \left(\frac{h - h''}{b}\right) y\right] dx\, dy} = \left\{\frac{h + h' + 2h''}{4(h + h' + h'')}\right\} b \quad \ldots\ldots(9)$$

If we now substitute in (8) and (9) for b, c, h, etc., their numerical values as given by the problem, we have $x_0 = 4.2272 +$ feet, the distance of the center of pressure from the side $A\ C$ of the triangle; and $y_0 = 1.6098 +$ feet, the distance of the center of pressure from the side $A\ B$. Substituting these co-ordinate values of the center of pressure for x and y in (1) we have $9.2266 +$ feet, the distance of the center of pressure below the surface of the water.

Hence, we have the center of pressure completely determined.

Integrating (4) between the proper limits, and substituting for $w = 62.4$, we find the resultant pressure upon the triangle equal to 17,160 lbs.

J. H. Serviss, C.E.

Englewood, N. J., Feb. 18, 1881.

MEXICAN NEWS.

The Yucatan Railroad Company has finished and opened to traffic thirty-two kilometers of the railway between Merida and Progreso, and the entire line will be completed in March. This company has from time to time experienced some difficulty in procuring a sufficient number of laborers, partially from the fact that the Peons, who have never been accustomed to such steady labor and exact hours, felt themselves oppressed and deprived of their liberty. Now, however, the state authorities have made arrangements to supply the necesary number of workmen, and also promise to pay the subvention more regularly than in the past. *Quien sabe?*

Any American contractor who undertakes to manage the Indian laborers here will need a goodly quantum of patience. These poor creatures, though honest and tractable, are so improvident and so accustomed to procrastination—to that eternal "manana" (to-morrow)—that they regard the activity and punctuality of American superintendents as more than unnecessary, and think them not only often unjust but even tyrannical. The chief "locating engineer" of the Palmer-Sullivan road—Mr. Miller—has given me some ludicrous accounts of his difficulties in training Indian laborers to exact hours; awhile ago a Mexican civil engineer remarked to Mr. Miller, "You are capable of exhausting the vitality of a thousand men per month."

"My dear sir," replied Miller, "all Yankees work at about the same rate, and to their energy the progress and power of the United States are mainly due."

The Boston Central Railroad Company displays the same activity which has hitherto characterized it. The road to Tula will be completed by March 1. The Central has now in this vicinity alone 10,661 laborers employed. Telegrams have been received from Vera Cruz announcing the arrival of four ships freighted with material for the Central, and ten other vessels with railroad material for that company are en route from the United States and England.—*Exchange*, Feb. 14.

The Colima branch of the Palmer-Sullivan road is partially surveyed. The company has just purchased two short lines which Mexican companies had partially constructed.

Two Alexandre steamers from New Orleans and New York and one from Morgan City all reached Vera Cruz on the 7th; forty Americans arrived in the City of Mexico next day; the hotels are so crowded that persons are seeking lodgings in private houses.

Diseases Peculiar to Tunnel Driving.

The disease and mortality among the laborers in the St. Gothard tunnel are represented as having been excessive. The distance between the entrance to the tunnel and the places where the perforators were at work, which was nearly five miles on the north side, coupled with the frequent freezing of the compressors, rendered ventilation extremely difficult; and the air was further fouled by frequent explosions of dynamite, the some 500 oil lamps, and the exhalations of 400 men and 40 horses, working in a temperature of eighty to ninety-five degrees. The men died in large numbers of a peculiar disease called tunnel trichinosis, from the presence of a tozoon in the intestines. Three or four months' labor in the tunnel brought on the disease, and twelve months generally made the laborer a confirmed invalid, even if he survived. The symptoms were yellowness of skin, features drawn, eyes half closed, lips discolored, skin humid, gait difficult, and digestion destroyed.

RENSSELAER POLYTECHNIC INSTITUTE ALUMNI MEETING.

Principally through the efforts of Messrs. Jas. P. Wallace, Francis Collingwood and Charles Macdonald, of this city, the first general meeting of the Alumni of the Rensselaer Polytechnic Institute of Troy, N. Y., was held on Friday evening the 18th at the residence of the Hon. Clarkson N. Potter, 16 Grammercy Park, that gentleman, himself a graduate of the Institute, on the subject being brought to his attention, warmly approving it and at once offering his house for the reception. The meeting was most enjoyable, and it is hoped will lead to similar re-unions hereafter. The following is a list of graduates who were present at the meeting:

Names.	Class.	Post-office Address.	Profession in Business.
Clarkson N. Potter	1843	61 Wall st., N. Y.	Lawyer.
Jas. P. Wallace	1837	52 Broadway, N. Y.	President N. Y. Guaranty and Indemnity Co.
Arba R. Haddock	1862	410 East 14th st., N. Y.	Malster and Brewer.
William Gurley	1839	Troy, N. Y.	M'f'r of Engineers' and Surveyors' Instruments.
Geo. W. Plympton	1847	151 Macon st., Brooklyn	Prof. of Physical Science, Polytechnic Inst.
Jos. C. Platt, Jr.	1866	Waterford, N. Y.	Manufacturer of Machinery.
David M. Greene	1851	Troy, N. Y.	Director of R. P. I.; Prof. of Geodesy, Road Engineer, and Topographical Drawing, Chief Engineer of Troy Water-Works.
J. Gardner Sanderson	1858	Scranton, Pa.	Prop'r Wallkill Portland Cement Co.; General Manager Union Electric Signal Co., Boston, Mass.
Robert Escobar	1857	52 Wall st., N. Y.	Bridge Builder.
Robert R. Chadwick	1878	Cohoes, N. Y.	Ass't. in Geodesy, R. P. I.
Edward R. Kellogg	1841	Elizabeth, N. J.	Real Estate Agent.
Alfred P. Boller	1861	71 Broadway, N. Y.	Bridge Builder, Ch. Eng. West Side & Yonkers R.R.
Frank L. Rowland	1875	N. Y. & B. Bridge Office, N. Y.	Civil Engineer.
Stephen W. Barker	1868	Troy, N. Y.	Wool Merchant.
Geo. B. Mallory	1867	New York City	Civil Engineer.
Horace Loomis	1865	Mt. Vernon, N. Y.	
Albert S. Greene	1850	Navy Dep't., Washington	Chief Engineer U. S. N.; Member of the Board for the Examination of Engineer Officers.
J. Forman Wilkinson	1847	Syracuse, N. Y.	Banker.
Fred. O. Burhaus	1853	Warrensburgh, N. Y.	Manufacturer.
Wm. B. Cogswell	1852	Syracuse, N. Y.	General Manager Mine La Motte, Mo.
Palmer C. Ricketts	1875	Troy, N. Y.	Instructor in Mathematics, R. P. I.
J. A. Kingsley	1880	176 Cumberland st., Brooklyn	Civil Engineer.
Wm. H. Burr	1872	Pawling ave., Troy, N. Y.	Prof. of Rational and Technical Mechanics, R. P. I.
Frank P. Whitman	.....	Troy, N. Y.	Prof. of Physics, R. P. I.
A. P. Kirtland	1871	Blairsville, Pa.	Asst. Engineer P. R. R. Co.
W. W. Walker	1856	Hannibal, Mo.	Gen. Supt. and Ch. Eng. St. L. & H. R. R.
Edmund Yardley	1856	346 Broadway, N. Y.	Pool R. R. Commissioner's Office.
C. C. Martin	1858	21 Water st., Brooklyn	First Asst. Eng. East River Bridge.
C. Whitman Boynton	1856	Woodbridge, N. J.	Manufacturer.
Jos. P. Davis	1856	New York City	Metropolitan Telephone and Telegraph Co., N. Y.
Thos. J. Long	1873	117 Duane st., N. Y.	Asst. Eng. N. Y. City Dock Department.
Theo. N. Ely	1866	Altoona, Pa.	Supt. of Motive Power, P. R. R.
Wm. H. Wiley	1866	15 Astor Place, N. Y.	Publisher.
James A. Skilton	1845	115 Broadway, N. Y.	Law and Patents.
J. Gardner Ambler	1833	25 West 23rd st., N. Y.	Dentist.
Albert R. Fox	1830	Sand Lake, N. Y.	Glass Manufacturer.
L. B. Cannon	1832	New York	Farmer.
O. F. Nichols	1868	Trenton, N. J.	Bridge Constructor.
Cnas. T. Judson	1875	Troy, N. Y.	Coal Merchant.
Alex. M. Lesley	1846	380 6th ave., N. Y.	Manufacturer.
John A Wilson	1856	410 Walnut st., Phila.	Civil Engineer.
Charles G. Weir	1877	24 East 10th st., N. Y.	U S. Asst. Engineer.
George O. Knapp	1876	Fulton Municipal Cas Company, Brooklyn	Gas Engineer.
D. F. Thompson	.....	Troy, N. Y.	Teaching.
Strickland Kneass	1839	Philadelphia, Pa.	Assistant to the President P. R. R. Co.
George H. Cook	1839	New Brunswick, N. J.	Vice-President and Professor of Chem. and Nat. Phil. in Rutger's College; State Geologist of New Jersey.
Henriques Harris	1860	212 Adelphi st., Brooklyn	Chief Engineer Manhattan Beach R. R.
Wm. H. Young	.....	Troy, N. Y.	Treasurer R. P. I.
Clark Fisher	1858	Trenton, N. J.	Manufacturer of R. R. Joints, Anvils and Vises.
A. E. Perrus	.....	Lansingburgh, N. Y.	Manufacturer Floor Oil-cloth; Banker.
Wm. Howard Douchty	1858	Troy, N. Y.	Attorney and Agent.
M. S. Verner	1876	Pittsburgh, Pa.	Supervisor P. V. H. Div. P. R. R.
Percival Roberts	1846	Philadelphia, Pa.	Iron Manufacturer, Pencoyd Iron-Works.
Wm. M. Allaire	1876	358 W. 32d st., New York	Assistant Engineer on Egyptian Obelisk.
Robert Van Buren	1864	153 Remsen st., Brooklyn	Chief-Engineer Brooklyn Water-Works.
Jacob E. Hoyt	1870	623 W. 16th st., Philadelphia, Pa.	Philadelphia Sugar House.
F. N. Wilson	1879	Princeton, N. J.	Instructor in Graphics, Princeton College.
J. E. Clark, M. D.	1845	Brooklyn, N. Y.	
Townsend V. Church	1881	Troy, N. Y.	Civil Engineer.
H. C. Shaw	1876	Troy, N. Y.	Draughtsman, Albany and Rensselaer Iron & Steel Co.
John Squires	1869	Troy, N. Y.	Civil Engineer.
Van Brunt Bergen	1863	Bay Ridge, N. Y.	Assist. Engineer Department City Works, Brooklyn.
Frank C. Draper	1856	Toronto, Canada	
Richard Schermerhorn	1870	Brooklyn, N. Y.	Engineer and Supt. Prospect Park & Coney Island R. R.
George H. Cushman	1879	Brooklyn, N. Y.	Freight Pool, New York City.
Warren T. Kellogg	1861	Lansingburgh, N. Y.	Manufacturer of Cotton Machinery at Cohoes, N. Y.
Wm. Metcalf	1858	Pittsburgh, Pa.	Steel Manufacturer.
James Hall	1832	Albany, N. Y.	New York State Geologist.
W. H. Breithaupt	1881	Berlin, Ont.	Civil Engineer.
P. de C. Cantauhede	1881	Maracaibo, Brazil	Civil Engineer.
James C. Knapp	1863	Philadelphia, Pa.	Manager Bullock Printing Press Co.
Wm. B. Cabot	1881	Brattleboro, Vt.	Civil Engineer.
R. I. Sloan	1859	New York City	Asst. Eng. Maintenance of Way M. E. R. R. New York City.
Thomas M. Cleeman	1845	340 S. 21st st., Philadelphia, Pa.	Civil Engineer.
H. W. Verner	1881	Pittsburgh, Pa.	Civil Engineer.
Joseph M. Knapp	1858	141 W. 58th st., New York	Vice-President Fort Pitt Foundry Co., Pittsburgh.
James H. Frothingham	1850	Brooklyn, N. Y.	Civil Engineer.
Wm. A. Ingham	1846	Philadelphia, Pa.	President Rock Hill Iron & Coal Co.
Joseph M. Wilson	1858	410 Walnut st., Philadelphia, Pa.	Engineer Bridges and Buildings P. R R.
David Cowee	.....	Troy, N. Y.	Trustee R. P. I.
F. H. Saylor	1867	Philadelphia, Pa.	Engineer and Bridge Builder.
H. B. Nason	.....	Troy, N. Y.	Professor of Chemistry R. P. I.
James Forsyth	.....	Troy, N. Y.	President R. P. I.
James McCrea	.....	Jersey City	Superintendent New York Div. P. R R.
John S. Schaeffer	.....	Newark, N. J.	Div. Engineer New York, Lackawanna & Western R. R.
W. Hasell Wilson	.....	233 S. 4th st., Philadelphia, Pa.	Consulting Engineer P. R. R.
Henry M. Wilson	1864	410 Walnut st., Philadelphia, Pa.	Assistant to Engineer of Bridges, etc., P. R. R
James L. Breese	1875	New York City	Architect.
Henry N. Brinsmade	1879	Lake Mahopac, N. Y.	Mining Superintendent Mahopac Iron-Ore Co.
Charles Macdonald	1857	52 Wall st., New York	President and Chief-Engineer Delaware Bridge Co.
Francis Collingwood	1855	New York City	Assistant Engineer East River Bridge.

The following is a list of the invited guests: Messrs. Albert Fink, John Bogart, Russell Sage, J. T. Burden, James A. Burden, John Crosby Brunn, Chester Griswold, Le Grand B. Cannon, Harrison Durkee, Wm. W. Wickes, Alexander M. White, Josiah M. Fiske, W. W. Rossiter, E. A. Wickes, H. H. Leland, A. L. Holley, Octave Chanute, George H. Frost, all of New York City; Dr. Cochran, Hon. J. S. T. Stranahan, Hon. Henry C. Murphy, Rev. R. S. Storrs, George J. Seney, Chas. K. Wallace, John S. Ward and Chas. A. Hull, all of Brooklyn; Prof. Daniel C. Eaton, Yale College, New Haven; Dr. Jonathan Edwards, New Haven; Hon. B. Hall, Troy, N. Y.; Ashbel Welch, Lambertville, N. J.; Dr. J. L. Hicks, Flushing, L. I.; Major F. C. Draper, Toronto, Can.; J. A. Kingsley.

Regrets were received from Mr. Duncan Greene of Troy, N. Y.; Mr. D. S. Babcock, N. Y. City; Mr. Henry Sedley, of the *Evening Post*, N. Y. City; Mr. J. B. Bishop, of the *Tribune*; from Dr. S. R. House, Waterford, N. Y.; and Mr. S. Edward Warren, Newton, Mass.

The guests were received by the host, assisted by Director D. M. Greene of the Institute, who, together with Messrs. Wallace, Collingwood and Macdonald, sought, by introducing those present, to promote the social enjoyment for which the re-union was held. Supper, provided by the host, was served at 10 o'clock, after which Mr. Potter, in proposing the health of Director Greene, said:

ALUMNI OF THE RENSSELAER INSTITUTE AND GENTLEMEN: When, not long ago, Mr. Wallace proposed to me to join in a meeting of the graduates and friends of the Institute, I gladly assented, and I have much pleasure in seeing you all this evening.

I was very young when I was at the Institute, and I was only there for a short time, and after I left there I became so engaged with other occupations as to prevent my keeping up that acquaintance with the Institute, its work and its graduates, that I could wish. I have never, however, ceased to feel a desire for its success and a sympathy with the studies which were pursued there. I have not, indeed, kept pace with the development of modern mathematics and do not understand quaternions and am quite unable to comprehend the fourth dimension of space, upon which some of the great German mathematicians insist; but I yet find much to interest me in the progress of science, and—thanks to my studies at the Institute—especially in the development of mechanics and the advance of engineering.

I am glad, therefore, to have this opportunity to renew and to extend my acquaintance with the graduates of the Institute. Many of them have attained high distinction in their profession, and as we fortunately have here with us Professor Greene, the Director of the Institute, you will, I know, all gladly join with me in wishing "success to the Rensselaer Institute," and in calling upon Professor Greene to speak to us of its Alumni.

Director D. M. Greene, remarked:

The Institute is now 55 years old. It has sent forth 739 graduates, an average of between 13 and 14 each year. Of these, at least 216 are entitled to honorable mention.

Without undertaking to mention all of these men, or to specify the particular things done by each, we may say that seven are Presidents, Assistant Presidents or Vice-Presidents of railways:

Geo. B. Roberts, Class of 1849, after nearly thirty years spent in the service of the Pennsylvania Railway, has been advanced to its Presidency.

William H. Clement, Class of 1835, is President of the Cincinnati Southern Railway Co.

W. W. Walker, Class of 1856, late President Sioux City & Pembina R. R.

Wm. L. Fox, Class of 1875, President of the Foxburg, Petersburg & Clarion R. R.

Strickland Kneass, Class of 1839, Assistant to the President of the Pennsylvania R. R.

A. J. Cassatt, Class of 1859, First Vice-President, Pennsylvania R. R.

H. V. Olyphant, Class of 1868, was, at the time of his death, Assistant President of the Delaware & Hudson Canal Co.

Eighteen have been, or now are, Chief Engineers of railroads, water and other public works. Of these we may mention:

Chas. Collins, Class of 1840, Chief Engineer Lake Shore & M. S. Ry., at the time of his death.

Chas. H. Fisher,* Class of 1852, Chief Engineer New York Central & Hudson River R. R.

T. C. Heizmann, Class of 1859, was for several years Chief Engineer of the Pennsylvania Railroad; G. W. R. Bailey, Class of 1838, was, up to the time of his death, which occurred a few years since, Chief Engineer and General Superintendent of the New Orleans, Mobile & Texas Railroad; Wm. B. Stillson, Class of 1867, Chief Engineer Caibarian & St. Espiritu Railroad, Cuba; L. J. de Viscarondo, Class of 1859, Chief Engineer of the Cordova & Malaga Railroad, Spain; Christopher C. Waite, Class of 1864, Chief Engineer and Superintendent of the Cincinnati & Muskingum Valley Railroad, and many others.

Of those who have been connected with other works, we may mention:

W. A. Roebling, Class of 1857, Chief Engineer of the East River Suspension Bridge; C. C. Martin, Class of 1857, Principal Assistant Engineer East

* Mr. Fisher left the Institute just before completing the full course.

River Bridge; Francis Collingwood, Class of 1855, Assistant Engineer East River Bridge, and several subordinate assistants.

Five have been or are now State geologists:

Ebenezer Emmons, Class of 1826, was State Geologist of North Carolina.

Douglass Houghton, Class of 1829, was State Geologist of Michigan.

James Hall, Class of 1832, State Geologist of New York.

Michael Tuomey, Class of 1835, was State Geologist of South Carolina and Alabama.

Prof. H. Cook, L. L. D., Vice-President of Rutgers College, and State Geologist of New Jersey.

Forty-four have been or are professors or assistant professors, among whom are two Eatons, of 1826; Emmons, of 1826; Edgarton, of 1828; Platt and Stevenson, of 1830; Sager, of 1831; Hall and Williams, of 1832; Smalley, of 1835; Horsford of 1838; Cook, of 1839; Anthony, of 1840; Pomeroy, of 1841; B. F. Greene and Hall, of 1842; Drowne, Edwards and Plympton, of 1847; Allen and Ferrao, of 1850; Warren, of 1851; Allen, of 1855; Wood, of 1857; Dodge, McMillan, Pemberton, Searles and Smith; of 1860; Fox and Fuertes, of 1861; Adams, of 1862; Burr, of 1872, and many others.

Thirty-five are Asst. U. S. Engineers, employed on river and sea coast improvements, and on the Coast Survey.

Five are Civil Engineers of the U. S. Navy, attached to Navy Yards. Mr. Menocal, Class of 1862, prominent as engineer of one of the Inter-oceanic Canal Schemes, is one of these.

Eleven are, or have been, engineer officers of the regular Navy. Among these are Clark Fisher, 1858, late Chief Engineer; A. S. Greene, 1859, Chief Engineer; John D. Van Buren, Jr., 1860, late First Assistant Engineer; B. Gowing, 1861, Passed Assistant Engineer; John Pemberton, Jr., 1860, Passed Assistant Engineer; R. D. Dodge, 1860, late Assistant Engineer; George M. Greene, 1859, late Passed Assistant Engineer, and others.

Five are or have been officers of the U. S. Army:

Wm. L. Haskin, Class of 1861, Capt. and Bt. Major 1st Artillery.

P. D. Vroom, Class of 1862, 1st Lieutenant 3d Cavalry.

Chas. E. Cross, Class of 1855, late Capt. U. S. Engineers.

Jas. R. Percy, Class of 1859, late Capt. U. S. Vol. Engineers.

James Cromwell, Class of 1861, late Major of Vols. U. S. Infantry.

Seven are presidents or chief engineers of bridge companies:

Charles Macdonald, Class of 1857, President Delaware Bridge Co.

F. W. Vaughan, Class of 1863, President Louisville Bridge and Iron Co.

John F. Alden, Class of 1872, Chief Engineer Leighton Bridge and Iron Works.

David Reeves, Class of 1872, President Phoenix Iron Co.

Henry G. Morse, Class of 1871, Chief Engineer Morse Bridge Co.

Henry G. McClellan, Class of 1869, Engineer Pacific Bridge Co.

In hydraulic engineering Hiram F. Mills, Class of 1856, Chief Engineer of the Essex Gas Works, at Lawrence, is probably entitled to rank next to J. B. Francis, of Lowell, who is recognized as the highest authority in that department of engineering in this country.

Among mining engineers the Institute refers with pride to the following gentlemen: R. P. Rothwell, Class of 1858; Walter Crafts, Class of 1859; Irving A. Stearns, Class of 1868; Edward Nichols, Class of 1871; Alfred S. Bertolet, Class of 1871, and any account of the distinguished men of the Institute would obviously be incomplete were no mention made of Professor Henry A. Rowland, Class of 1870, Professor of Physics in the Johns Hopkins University, of Baltimore, Md., a young man who has already attracted the attention of, and taken rank with, the most eminent physicists of Europe.

John D. Van Buren, Jr., Class of 1860, beginning as a junior assistant on the Croton Water-Works, entering the Engineer Corps, U. S. N., in 1861, passing through three of the four grades in that service, and being assigned to duty as a member of the Academic Staff of the Naval Academy, and assistant in the Bureau of Engineering at the Navy Department; later, acting as principal assistant to Gen. McClellan while he was Engineer-in-Chief of the Department of Docks, New York City; called from this service to act as a member of the New York State Canal Investigating Commission, in 1875, and in the same year elected State Engineer of New York, is clearly entitled to rank as a distinguished Alumnus of the Institute.

Robert Van Buren, class of 1864, entered the service of the Brooklyn Water Board, and after a continuous service of over fifteen years, now occupies the position of Chief Engineer of the Department of Public Works of the City of Brooklyn.

In politics, among those who have achieved honorable distinction, our worthy host takes high rank.

John C. Underwood, class of 1862, has recently completed a term of service as Lieut.-Governor of Kentucky, and is represented as being certain of further political advancement within a very few years.

Geo. R. Dennis, class of 1839, has served a term in the Senate of the United States.

In looking over the foregoing names it will doubtless be found that very many names have been omitted which ought to have been mentioned.

It could scarcely have been expected that any one graduate should possess sufficient knowledge of the details of the professional experiences of so many gentlemen to enable him to do them full justice on an occasion of this kind. Their works, however, are known and thoroughly appreciated by their professional brethren, and, to some extent, at least, by the general public.

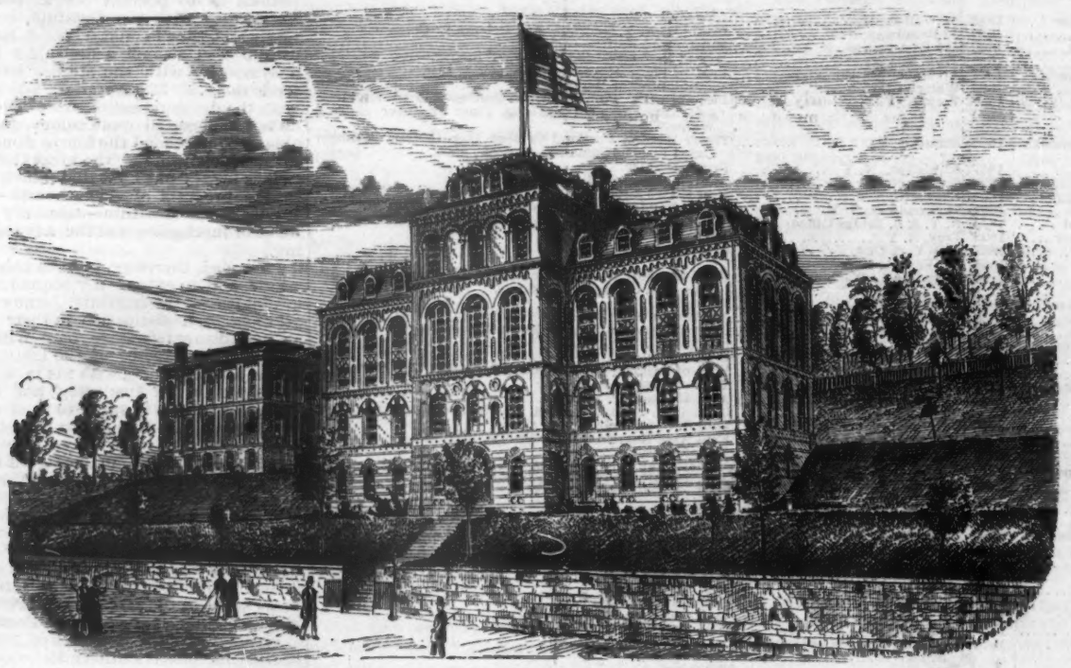
Mr. Potter then said: We are fortunate in having here this evening a distinguished gentleman from the city in which the Institute is located—the beautiful and enterprising city of Troy, the kindness and hospitality of whose people when I was a student there at the Institute I shall always gratefully remember.

This gentlemen has long been the head of the Board of Trustees of the Institute, and is especially fitted to tell us of its work, its aims and its needs. I beg therefore to call upon the Hon. James Forsyth, of Troy, to address you.

Judge Forsyth, in responding, drew a comparison between the value of classical literature, to which, in his school days, great attention was paid, to the exclusion of the more useful and practical studies, such as now form the course of the Rensselaer Polytechnic Institute. He was pleased to see so many graduates of the Institute here this evening; they are men whose work is known all over this country, and indeed much of it all over the world. He regretted the apathy of the people of Troy, who actually seemed to know less of the Institute and its results than was known in New York City. He had taken a part in the management of the Institute, but he, as much as any man, and perhaps more so, could see the need of reform therein. He thought the first step was to get a new president. He had held the office for twelve years; but he was a lawyer, busy in the practice of his profession, and the office at the Institute was but a side issue. The trustees are also all men of business, and had many things to look after, so he considered that the present management needed a change. Some graduate should be president, a person who is actuated by an earnest desire to promote scientific education. He considered the course of study to be superior to that of West Point, and he hoped the spirit that was apparent in the meeting this evening would grow until new life and enthusiasm would be instilled into the people of Troy with respect to the noble institution in their midst, so many of whose graduates he had the pleasure of greeting this evening.

Mr. Potter—Judge Forsyth's motion, gentlemen, is out of order, at least for this evening. I should not have called upon him to speak if I had known he was to be so personal in his remarks.

Gentlemen offering to speak hereafter will do



RENSSELAER POLYTECHNIC INSTITUTE.

so upon the understanding that we shall have no more personalities.

Those of us who go up and down town cannot fail to be daily impressed with the progress and magnitude of that great work of engineering which is presently about to more closely connect this opulent and worldly metropolis with our sister city across the East river, the City of Churches.

The Brooklyn people are very wise in their generation, and it is not surprising, therefore, that they should have selected Rensselaer men to conduct the construction of this great work. An assistant engineer of this great work is present, and I take pleasure in asking him to tell you of its progress and success, and beg to introduce to you Mr. Francis Collingwood.

Mr. Collingwood, in response, said:

I cannot help a feeling that, as one of the Committee on Invitations, it would be in better taste for me to have nothing to say to-night; but we have felt throughout that the wish of our worthy host should be a law to us, and in obedience to his request I will say a few words.

The subject assigned to me, as I understood it, was "The Relations of the Bridge to Science in General, and Particularly to the Rensselaer Polytechnic Institute."

To one who has devoted nearly twelve years of his life to the study of one object, it comes to be so familiar in all its details as to appear commonplace, and to make him feel that nothing new or interesting can be said upon it. Particularly is this true when that object has been the theme of newspaper comment and description from its inception.

I have been asked to connect the bridge in some way with the Institute which we meet to honor. It is in order, therefore, to say that six of its graduates are at present employed upon the work, four of whom are here present. It is a great sorrow to us all that our chief, who bears the honored name of Roebling, and who inherits all his father's tenacity of purpose and true engineering instincts, and who would delight to be with us to-night, should have been for so many years an invalid through devotion to duty in a time of trial and danger.

You all know the story of the fire in the Brooklyn caisson, and of the nervous shock which Col. Roebling then received, from which he has never recovered.

It is pleasant, however, to add that he has never lost his hold upon the work, but pays careful attention to all matters where his advice and counsel are needed.

The men who have come from the Institute to the bridge have come to stay; and this seems to be true on whatever enterprise they are employed; they seem to have a wonderful sticking power.

Higher praise can hardly be accorded the Institute than this; for it shows that her men are well equipped for their work, that their worth is everywhere recognized; and that with experience they are fitted for the highest engineering positions.

There can be no question that the training given at the Institute is just of that kind which teaches a man how to use himself; it is a true education in the literal sense of the word, developing and bringing out the man. It does not try to make walking cyclopedias of young men, but to thoroughly ground them in the general principles of science, leaving them to fill in the details from their own experience.

I cannot better illustrate my meaning than by a bit of personal history, and trust I may be pardoned for introducing it.

When asked whether I would like to sink the Brooklyn caisson, then in process of construction, I replied that I supposed I could do it as well as anyone, for the sinking of so large a mass was yet an untried problem. This was said in no boastful spirit, but from a profound conviction that the work could be done, if sound general principles were kept in view.

The principles involved were exceedingly simple. Given a mass of material covering seven city lots, and weighing about 28,000 tons before sinking was completed, under which we were to burrow and lower it safely to place.

The weight we knew, and the uplifting force of the air pressure was known. The unknown element was the side friction from the pressure of the outside earth, which had to be overcome.

The work to be done was, to always keep the downward pressure in excess, being careful that it should not be too great; and to so manage the work that the settlement should be uniform.

The *details* were complex, but a reference to general principles solved all questions as they arose.

Owing to the advances in practical science, made in the few years that have since elapsed, many of the things which then troubled us very much would *now* be of no moment. The telephone, particularly, would have been of great benefit.

The bridge was the pioneer in structures of its magnitude, and is even yet unique in its way. There were few new scientific problems to work out; but the difficulties arose from the magnitude of the work. The question most frequently asked of any was: do you think it *possible* to do this or that? and predictions of failure were innumerable.

When the time came for letting the building of the Brooklyn caisson, it was with difficulty that any bids were obtained. To launch a mass of 168' long and 102' wide, *broadside*, was so contrary to to the experience of all ship-builders, that they wanted large odds for the risk involved.

The launch was entirely successful, and, as a result, the next caisson, although requiring much more work, was let for little more than half the amount.

There is nothing novel in the construction of the masonry of the towers and anchorages. It only required a careful adaptation of means to the desired end: so that all material could be hoisted and placed in position safely and expeditiously.

One rule which has been followed throughout the work is, that no temporary work, such as derricks, scaffolding, etc., should be used without a careful proportioning of the minutest detail to the strains involved. As a result it may be truly said that no person has been injured by the breaking of any temporary work except from a defective weld, or the cutting of a rope.

This is conspicuously different from the cut-and-try method pursued by the so-called practical men.

Another way in which the bridge engineers have tried to do scientific work was in the careful arrangement of engines, tracks, turn-tables and the like for economical working. These things have uniformly been made a careful study, and complete plans worked out in advance. In consequence, the mechanics have never been stopped for lack of material, notwithstanding the crowded streets through which much of it had to be carried, and the limited space in which it was stored and handled.

Coming to the iron and steel work, we were the first in this country to call for iron links of the large sizes used in the Anchor chains.

The most important question, however, was, what material shall be used in the cables? Col. Roebling had become convinced that although iron had always been used, steel was "the metal of the future," and that it ought to be used in the bridge.

At that time it was not known what, if any, quality could be obtained which should be sufficiently uniform to answer the purposes required. Specimens of steel wire were therefore procured from the leading foreign and American manufacturers, and a series of tests instituted to determine what requirements should be specified in contracting for it. It is needless to pursue the long discussions which followed, but it has passed into history that bidders were found who undertook to produce the wire, and it has all been furnished. It is not too much to say that in this matter the bridge tests led the way, in this country at least, to a better and more uniform quality of steel product.

These tests, and the experiments for determining the best form of splice for the coils of wire, together with the adjustments of wires and strands, were under the immediate charge of Col. W. H. Paine. I wish I might say that he was a graduate of the Institute, for he would honor it.

It was first intended to use iron in the superstructure from the apprehension, since *fully* verified, that serious delays would ensue if steel were adopted.

On account, however, of the increased usefulness of the bridge by using steel, from the saving in dead load, this latter material was at last decided upon.

The *discussion* of the matter, and the successful use of steel in the cables, had, no doubt, an influence in directing other minds toward its employment in bridge work. There can be no doubt that so soon as our manufacturers prepare themselves for the uniform production of steel in bridge shapes its use will be rapidly extended.

The most recent work done is the masonry of the approaches. These are in nowise novel, except in their imposing character, and they hardly yet seem to be appreciated by the citizens who see them daily.

It is worth something to have in the midst of so much sham work, such a specimen of thoroughly honest work. No problems in brick or stonework have been dodged, and everything has been built to endure.

There is as much masonry below ground as above. For nearly four years we have been piling up brick-work at the rate of 50,000 to 250,000 bricks per day, besides a large amount of stone and concrete work, and still the work is not complete.

There has been a feeling that the bridge ought to be built more speedily. There have been some delays from pecuniary embarrassments and legal obstructions, over which the engineers could exercise no control; but for a large share of the time the utmost capacity of our docks and piers has been taxed to do what has been done.

The immense quantity of material to be moved has taken time.

I have worked up a rough summary of materials moved and to be moved to give you an idea of this. It is as follows:

About 12 million ft. timber of all kinds.

About 175,000 cubic yards cut stone, beside a large amount of rough stone in foundations.

About 27½ millions of bricks, aside from old bricks from buildings.

About 7 million pounds of steel wire.

About 2 million pounds of iron anchor bars.

About ¾ million pounds of iron in saddles and plates and anchor plates.

About 1 million pounds of iron in other permanent bars, suspenders, etc.

About 10 million pounds steel in superstructure.

About 3 million pounds iron in street bridges; aside also from sand, excavation, machinery, etc.

To do the work, there have been at times 34 steam engines, 34 horses and nearly a thousand men employed; 13,700 tons of coal have been used, etc.

We believe that we are *nearing* the end rapidly, but have been disappointed so often that we dare not prophesy as to an exact time.

When the work is completed it will for all time be a monument to the progress of practical science in *our* day and generation, and an art work which the citizens of New York and Brooklyn may well feel proud of.

From beginning to end the plans for the bridge have been developed by scientific methods. No empiricism has had a place; the cut-and-try method has been unknown; and, as a consequence, uniform success has followed the prosecution of the work.

It is not too *much* to say that to this success the Rensselaer Polytechnic Institute, in its proper sphere, has contributed no mean part.

Mr. Potter then said:

The chief superiority of the modern over the ancient civilization is in the superiority of the modern methods of communication. Of all these means of communication the railway is the most important, and nowhere has the railway been so generally introduced as in this country. Among all the great railways of the country, none is more distinguished for its magnitude, its power, the ability with which it is managed and the perfection of its service than the Pennsylvania Railroad Company. Its president, as you know, is a graduate of the Rensselaer Institute. He came on from Philadelphia to be present this evening; but he has unfortunately been prevented by illness from being here. In his absence, I venture to call upon the consulting engineer of the company, who has been so since the commencement of the work, and who has had a very large experience with the men of Rensselaer, and I beg to introduce to you Mr. W. Hasell Wilson.

Mr. Wilson remarked that previous to 1834 there were no engineers except at West Point. About that year numerous engineering works were projected. Engineers were scarce, and in such great demand that they were improvised from farmers, doctors, clerks, etc. Some of these, having good natural abilities, did well; many were failures, but it was surprising how few errors were committed. This deficiency was soon attended to. The Rensselaer Polytechnic Institute enlarged its advantages for civil engineering studies, and, though its growth was slow, as it became better known and its standard of education was raised so it was appreciated, and its graduates readily found good situations always open to them. In 1828 his father was chief engineer of the Philadelphia & Columbia Railroad. Mr. Wilson was then twenty-two years old, had no engineering knowledge, but he induced his father to give him a place on the survey. The duties on preliminary work were not difficult, but as promotion came he realized the deficiency in his education, which, however, he remedied as far as he was able by constant study, and though he got through it would have been much easier and more satisfactory if he had had the benefit of a proper scientific training. His own experience having shown him the value of proper education, he had made it a rule to give the preference to raduates of a technical school. He does not as-

sert that there are not many very excellent and distinguished engineers who have not taken a college diploma, but he considers that the chances of success are in favor of the educated man. It is a good plan for a young man to lay a good foundation of theory before commencing to practice. In many colleges scientific departments have been organized, but they are only secondary, and not one of them can be considered equal to the Rensselaer Polytechnic Institute which makes civil engineering a specialty. The plan of combining practice with theory pursued there is a great advantage; the alternation is beneficial, and the familiarity with field work is of immense value when the actual test of his abilities comes to the student. The value of the training at the Institute is well understood by the men who direct the public works of the country, and especially in railroads. On the Pennsylvania Railroad we have found graduates in engineering much more reliable than those who were not. We have now thirty graduates on that road, and he thought that their services on that road had proved so valuable as to warrant its officers in warmly encouraging the Institute. His own appreciation of the Institute has been shown by his sending three sons there to be educated, and he thought that they would not do discredit to it.

Mr. Potter—Mr. Wilson has indeed proved himself a friend of the Institute. He has furnished three sons for its classes, each of whom has graduated with honors, and is now on his way to success and distinction in his father's profession. I hope each one of you will go and do likewise.

Mr. Collingwood said that it was the distinction of the men of Rensselaer that they were trained to thoroughness; that what they did they did well, so that those who had them in service were loth to lose them. But the men of Rensselaer not only have shown themselves to be thorough and competent, and in demand for the great works of mechanics and of engineering, but they have shown themselves to be competent and successful teachers as well. One of them, Prof. Plympton, the Vice-President of the Brooklyn Polytechnic School, I see here to-night, and I take leave to call upon him for his views as to technical instruction.

Professor Plympton prefaced his remarks with the well-known definition of Civil Engineering given in the preamble of the Constitution of the Institution of Civil Engineers, and remarked that there were two classes—teachers and taught—and neither class can afford to undervalue the other. Curious incongruities sometimes occur. The author of a well-known engineering work, in attempting to lay out a simple culvert, made the cost of his work much greater than a practical man would have done; at the time the Atlantic cable was projected the practical man objected and predicted failure. But the cable under water came under new conditions which the practical man could not determine in advance. The learned Professor then sketched the comprehensive field covered by civil engineering, and noted especially the value of the services of the engineer in detecting charlatanism and guarding the public against it. It was a strange fact that the devotees of the "perpetual motion" craze never brought their devices to an educated civil engineer for indorsement, and the inventors of wonderful "motors" were not solicitious of the investigation of civil engineers into their model machinery. The professor described some instances of how the public were deceived by cunningly-devised machines which any competent engineer would at once pronounce a fraud, and advised the consultation of engineers respecting patents before investing money in them. The relative importance of the Rensselaer Polytechnic Institute to other similar schools was very high, and he advised students to go there, and closed by hoping that the standard of education of civil engineers would never be less.

Mr. Potter then said:

Gentlemen, among the earliest and most distinguished graduates of the Rensselaer Institute was Dr. James Hall, the eminent geologist of the State. No one more thoroughly understands the history of the Institute, and the efficiency and character of its work. I beg him to come forward where we can all see him and hear him while I propose his health.

Dr. James Hall remarked that he had a great respect for the Rensselaer Polytechnic Institute; it was fifty years since he entered it as a student, expecting to become a civil engineer. Had he adhered to his original purpose, he probably would have found more sympathy and money than he had as a geologist. The life of a thoroughly scientific man in this country is not an easy one, and geology is not a remunerative pursuit. He was greatly satisfied with what he had heard this evening; the training of the Institute would bring out all there was in a man; each student was obliged to give his own idea, not that of the text books; they were taught to cultivate the brain and not the stomach. When he commenced his studies in the Institute no university in this country had a scientific department; it was a citizen of New York City who was the first to found a polytechnic school. He regretted that he had not kept up a more intimate acquaintance with the Institute; he had been working in the beds below, and had not come to the surface. The importance of a knowledge of geology to civil engineers could not be overestimated. Mr. Hall related a personal incident in which he had shown Mr. Thos. Turner, of the Chicago & Galena R. R., how to determine the existence of gravel from the surface indications. This information saved the railway company over $50,000, and in this circumstance he was glad that he had contributed something to civil engineering. He was indebted to a professor of Rensselaer Polytechnic Institute for his position in the Geological Survey of the State of New York. He was pleased to meet here so many of the graduates, and although he was quite ill, yet he felt well recompensed for his coming to the meeting, and could afford to be sick for a week.

Mr. Potter—During the evening several gentlemen have expressed their surprise at learning that I was a graduate of the Rensselaer Institute. I was only about 17 years old when I was there, and was there but a few months, and I have always thought that I got my degree largely through the coaching and favor of Prof. George H. Cook, who was then the Director of the Institute. I desire to make him my acknowledgments, and in proposing his health to couple his name with that of Prof. B. Franklin Green, who succeeded him as Director of the Institute, whom so many of you gratefully remember.

AN ESTIMATE OF THE INSTITUTE.

To the Hon. Clarkson N. Potter, and Messrs. Wallace, Collingwood and Macdonald:—

Gentlemen: My own strong personal regard for the Institute arises from my belief that it has done more for the cause of sound practical education than almost any other institution in the country. I don't know that I ought to make a single exception when I remember the long time it has been doing its work, and the large number of men educated there.

And had I a boy or a friend to educate as a teacher, I should prefer such a course for him as I had at Troy to that which any Normal School in the country could afford. I remain

Yours, very respectfully,
Edw. A. H. Allen,
Prin. Sawin Academy, Sherborn, Mass.

THE VALUE OF SCIENTIFIC EDUCATION.

Dr. S. R. House's compliments to Hon. Clarkson N. Potter and Messrs. Wallace, Collingwood and Macdonald, and regrets that he will be unable to accept the invitation with which they have honored him for the 18th inst. It is not, however, that the 47 years since he graduated have diminished the interest he feels in the institution, to which all his life long he has been so greatly indebted. The benefits of the lessons in practical science there learned followed him to the mission field in far distant Siam and won favor for him and the cause he served, with the highest rulers of the land.

He has ever been proud of the record of the School, and his fellow alumni to the latest generation will have his best wishes for their success in life.

May those privileged to meet on Friday evening "renew their youth" as they live over their student days.

Waterford, N. Y., Feb. 15, 1881.

A POLYTECHNIC INSTITUTE "CREED."

Newton, Mass., Feb. 15, 1881.

Hon. Clarkson N. Potter and Messrs. Wallace, Collingwood and Macdonald:

Gentlemen: Often meditating from time to time on the R. P. I. and by-gone days there, and in connection with valuable, but very different, experience since leaving there, certain fundamentals to its welfare are almost always at hand in my mind. I mey mention some of them:

I. In a class of institutions still so comparatively unique in this country I think it is *well* to have a distinct *scientific* head, a "Director," as well as the traditional "President," of other associations. Thus settled, *such Director should be a man of broad culture and commanding character and influence;* and, if also a working professor, deep in his specialty, and with capacity for original work in some one of the main departments of the school; physics, mathematics, mechanics, geodesy, or possibly some other, or, if not an original genius, a *masterly teacher.*

II. I believe that the principle of "division of labor," so universally approved and applied in all other pursuits, belongs equally to educational organizations. Hence I say, let each institution aim at perfection *in one line*, and let a university of all professions be the mental aggregate of different independent schools; *at least, unless* an institution is so magnificently endowed, and thoroughly schemed from the beginning, as to consist of a series of separate schools of civil, mechanical, engineering, mining, architecture, technical physics, chemistry, natural history, each complete, in a separate building, with its own faculty and head; unity being given to the sum total by such general building as a museum, library, chapel and gymnasium, and by such a body as a director-in-chief, with a council. But my experience is that to attempt this under one faculty, in one building, creates, in comparison with a one degree institute, like the Rensselaer Polytechnic Institute, confusion, distraction, collision and loss of time.

III. It seems to me of high importance, in order to infuse new life into the R. P. I., that its alumni, especially since 1850, perhaps—and say for example, by one for each seven years since that date—should be represented in its board of trustees. It seems preposterous that such a body, however honorable, long-suffering, and praiseworthy otherwise, should be all local, mercantile, or of early date. Some, at least, should be *national, professionally scientific, and recent.* And as our colleges now-a-days notably keep themselves before the public by *local* as well as by general alumni associations, I hail the meeting now called as the possible beginning of such a New York association of R. P. I. alumni, to be followed by others in Philadelphia, Chicago, etc., and which might effectively favor the new trusteeship here advocated, as well as otherwise benefit the Institute.

IV. Whatever differing of opinions may exist as to the general endowment of professional scientific schools, as places where, as some think, tuition ought to be high, because the knowledge gained is, and is meant to be, pecuniarily profitable from the time of graduation, there would seem to be no chance for doubt as to the propriety of their thorough *equipment.* They, far more than any other institutions, must have tools to work with. The departments of mechanics, physics, chemistry, geodesy and graphics should all be amply furnished with laboratories or collections, as well as lecture rooms; and such endowment as would amply equip these should by all means be provided together with that of a fit observatory and library. Endowments of chairs may or may not then be limited to such moderate amounts as would merely provide for fluctuations in attendance, occasioned by varying general prosperity, as would be, in fact, a sort of financial balance wheel to avoid alternating variations in salaries.

V. Situated as the Institute now is relative to the educational traditions of the country generally, with the invaluable character impressed upon it from 1850–60, and well perpetuated from 1860–70, not to speak of later years of which I am less informed, or of earlier ones which led up to fuller developments, *I think it is now, and long will be, of prime importance that a clear majority of the Faculty, and, above all things, the Director,* should be Institute graduates, in full sympathy with the best traditions of 1850–70 relative to the *uncompromising maintenance of high standards for admission, class translation in every subject, and graduation,* and sternly frowning on aught other than this as high treason to the Institute.

VI. Our American polytechnic schools stand in two categories: While all agree, I suppose, that the professional scientist should be a man of as broad and elegant culture as in any other professional man, the want of adaptation of most existing preparatory and collegiate institutions to the polytechnic schools renders the terms of admission to the latter both inadequate and one-sided. Such terms should include, besides reading, spelling, grammar, geography, arithmetic, algebra and geometry, something in physics, French *or* German, history and drawing, with a strong general requirement or recommendation of a general English education. Some schools, lamenting lack of general culture, try to give it within their walls, to the confusion and damaging abridgment of their proper work. Others "let it slide" through with regret, in order to do their proper work more fully and better. The polytechnic school that soonest has faith to materially advance its requirements for

admission *step by step for three years, giving a year's notice of each advance*, will be the one to hold and keep the first place, other things favoring.

This is my R. P. I. creed, and the whole of it, so far as I can now collect my thoughts. Much regretting the impossibility of my being present at so pleasant a meeting, I send these hastily prepared thoughts as the best I can do for an occasion which I hope will lead to much good, and I have the honor to be, very truly, your and the Committee's obedient servant, S. EDWARD WARREN.

We take the following from The New York *Evening Post*:

The rank and worth of the Rensselaer Polytechnic Institute among scientific schools have long been recognized as they deserve by men best qualified to judge them, but the merits of the Institute are not so widely known among the general or non-scientific public as they should be. There is, perhaps, no establishment of learning anywhere in which both exact and natural science are taught more thoroughly or more comprehensively than at the Rensselaer Polytechnic Institute; and the country, as it grows, has more and more need of these special advantages. Whatever tends to spread the knowledge of their existence or to do honor to those who have contributed to make the Polytechnic Institute what it has been and is should therefore be welcomed and encouraged. Hence it is a pleasure to us to say that the meeting of the alumni and their friends last night, at the hospitable dwelling of Mr. Clarkson N. Potter, was in all ways creditable and satisfactory. It is intended to make these meetings regular ones, like those of the Princeton and Amherst alumni lately organized, or the older similar associations of Yale, Harvard, Bowdoin, Williams, Cornell and Dartmouth; and we hope and do not doubt that they will do good, not only in directing attention to the exceptional qualities of an admirable institution, but in bringing together in kindly fellowship its alumni, who, not only from early association but from the community of their youthful pursuits and mental habits, may be supposed always to cherish an interest in each other's later career.

THE AMERICAN INSTITUTE OF MINING ENGINEERS.

Concluded from Page 72.

The third day's session was opened at 10 a. m., Thursday, in the hall of the Franklin Institute, by Dr. C. B. Dudley, chemist of the P. R. R. Co., with an interesting paper on "The Wearing Power of Steel Rails in Relation to their Chemical Coaposition and Physical Properties," which was followed by a paper on "Rail Patterns," by A. L. Holley, C.E. L. L. D. Dr. Dudley's paper was then discussed at length by R. W. Hunt, of Troy, N. Y., W. R. Jones, of the Camden Iron Works, William Sellers, of Philadelphia, William Metcalf, of Pittsburgh, and Mr. Ashbel Welch, Lambertville, N. J.

THE SPITZLUTTE FOR THE LABORATORY.

"Notes on the Spitzlutte for the Laboratory" was the subject of the first paper at the afternoon session. Professor R. H. Richards, of the Massachusetts Institute of Technology, explained the spitzlutte as an instrument to separate sands.

Secretary Drowne read, in the absence of F. H. Daniels, of Worcester, Mass., a paper by the latter on "Gas Producers Using Blast."

"Coal Washing," by S. Stutz, of Pittsburgh, was the next paper. Mr. Stutz gave a comprehensive idea of coal washing, which process he said was of great advantage, because it cleansed the coal of all impurities. "It possesses, however," he continued, "one disadvantage, because the coal must be crushed into small pieces. There is no specific rule governing coal washing, and no one set of machinery will suit every location."

After the reading of two papers by J. W. Cloud, of Altoona, on "Steel for Bridges" and "Sparks from Express Locomotives," the Institute adjourned. In the evening the members attended the Annual Subscription Dinner given in the Union League Club House, under the direction of the following committee: Franklin B. Gowen, J. P. Lesley, Henry Pettit, John Birkinbine, Henry S. Drinker, P. Roberts, Jr., R. W. Davenport, William Burnham, J. S. Alexander, Charles A. Brinley, G. A. Koenig, William Lorenz.

The banquet was attended by about two hundred ladies and gentlemen, and was, from first to last, a most enjoyable affair. The "Institutes and Ordinances of Menu," compiled under the direct editorship of the talented and industrious author of "Tunneling," Mr. Henry S. Drinker, were presented to each guest in a delicate little book of eight pages, printed on the finest paper and in gold ink. Here are the contents of the volume:

ANNUAL MEETING
OF THE
AMERICAN INSTITUTE OF MINING ENGINEERS.

SUBSCRIPTION DINNER HELD AT THE UNION LEAGUE HOUSE, PHILADELPHIA, FEB. 17, 1881.

"Leave hops behind, all ye who enter here!"—*Old Song.*

HAUTE SAUTERNE.

"The juice it is! To be tested in a beaker."—*Fresenius.*
"Thoroughly matured and well expressed."—*The Nation.*

SHERRY—AMONTILLADO.

"Decant carefully and without precipitation."—*Roscoe.*
"Spanish shore. Preferred for Bessemer Pigs."—*Rural New Yorker.*

OYSTERS—BLUE POINTS.

"Economy lies in the direct use of raw material."—*Dr. C. W. Siemens.*
"Showing semi-conchoidal fracture and mother of pearl luster. Prognostic characters well known. Preferred by collectors to those which occur in quartz."—*Dana.*
"Removable shells. My patent."—*A. L. Holley.*

SOUP—A LA REINE.

"The whole charge may be poured at one operation."—*Sir Henry Bessemer.*
"A lady-like washer subject to royalty."—*Webster on Patents.*

PATE—A LA FINANCIERE.

"The financial operation at this stage is more important than the chemical one."—*I. Lowthian Bell.*
"A pay-streak cooked for capitalists."—*Obscure Author.*

HOCK—NIERSTEINER. LEIDEN.

"The old acid process will always have a place."—*P. von Tunner.*
"Standard solution for problems in volumetric analysis."—*Mohr.*
"Found near the extremities of a horse."—*Prime's Cotta.*

BORDEAUX—CHATEAU MARGAUX.

"This produces a good bloom."—*Captain William R. Jones.*
"Run out, puddled, and brought to nature. Good enough for any bar."—*John Griffin.*

ROCK FISH—AU GRATIN.

"A Siemens product."—*G. J. Snelus.*
"Phosphorus may be added if the charge is deficient."—*E. Windsor Richards.*
"A fissure-lode."—*Prof. J. S. Newsbury.*

POTATOES—A LA HOLLANDAISE.

"A Dutch plant above, with a Root blower."—*J. Miller.*

ROAST—FILET OF BEEF WITH TRUFFLES.

"You can't put in too much good material."—*John Fritz.*
"Taken from a cross-cut and improved by roasting and dressing."—*Rittinger.*

POTATO CROQUETTES.

"Piled, rolled, and reheated."—*W. E. C. Coxe.*
"Balled in the Krupp Rotator,"—*The Young Puncher's Assistant.*

FRENCH PEAS.

"A kind of settler operated by agitation."—*Annales des Mines.*
"Remains of a shelled deposit."—*J. W. Dawson.*

CHICKEN—A LA ROYALE.

"A burden not to be re-fused."—*Wedding.*
"Plucked for the benefit of experts."—*Denver Tribune.*

ROMAN PUNCH.

"The flow of solids is made apparent by the application of our cold punch."—*William Sellers.*

CHAMPAGNE—DRY MONOPOLE, JAUNAY.

"Unless the lining material is dry, explosions will occur."—*Capt. R. W. Hunt.*
"The Landsman's gas-producer."—*W. P. Shinn.*
"The only formation in which Carbonic Acid is in place."—*Prof. T. Sterry Hunt.*
"Care should be taken, lest the charge blow out the tamping, causing a waste of force."—*H. S. Drinker.*

TERRAPIN.

"A kind of tortas got from slimes."—*Raymond's Glossary.*
"Hanging and foot-walls are well defined, the vein matter easily detached, and well worth working."—*Clarence King.*
"The most powerful jaw-crusher in the market."—*Prof. W. P. Blake.*

CELERY—A LA MAYONAISE.

"A sort of mixed pickle brought to grass."—*C. Le Neve Foster.*

CHEESE—ROQUEFORT AND BRIE.

"Blende with other things."—*Quenstedt.*
"Reduce the burden gradually."—*Edward Williams.*

CHARLOTTE RUSSE.

"A deposit between well-defined walls with slickenside and a good gouge."—*Leadville Report.*
"A foreign lady transplanted hither by the blandishments of the Baker Expedition."—*New York Herald.*

MERINGUE—A LA CREME.

"A fine suite of the kind."—*Prof. T. Egleston.*
"At this stage of the process the cinder is very light and fluffy."—*Dr. Percy.*
"Bomb-like concretions filled with foreign substance."—*Frazer's Weisbach.*

ICE-CREAM AND WATER ICES.

"Surface condensation protects the boiler from corrosion."—*Bourne's Catechism.*
"Pulp from a Chili mill."—*J. Arthur Phillips.*

FRUITS.

"The best product of blooms."—*William Metcalf.*
"Grows on hanging, but frequently found near the foot."—*Oscar J. Heinrich.*

COFFEE.

"Adit."—*Prof. Warington Smyth.*
"Digest the whole with a strong infusion."—*Dr. Charles B. Dudley.*

LIQUEURS.

"Dissociation occurs at this stage."—*Dr. T. M. Drowne.*
"After Damp."—*Eckley B. Coxe.*

TOASTS.

"The success of the process depends very largely upon the after-blow, during which the remaining phosphorus is eliminated."—*Sidney Gilchrist Thomas.*
"At this point the bosh begins."—*P. F. Witherbee.*

The regular toasts were responded to by Prof. Silliman, Dr. C. B. Dudley, Dr. A. L. Holley, Prof. Persifor Frazer, Commander Gorringe, Hon. Wayne MacVeagh, Hon. Eckley B. Coxe, Dr. R. W. Raymond, and Retiring President Wm. P. Shinn. As Dr. Raymond has expressed in his report to the *Engineering and Mining Journal*, "the climax in the career of the Institute has been reached" in this very successful convention.

The Friday a. m. session of the Institute was opened by Mr. William Metcalf, of Pittsburgh, reading a paper on the query, "Can the Magnetism of Iron and Steel be used to Determine their Physical Properties?" The paper was in answer to Dr. Dudley's paper of the preceding day, so far as the specifications for testing iron and steel are concerned.

"There are so many parallels," Mr. Metcalf said, "between the action of magnetism on iron or steel, and the action of iron and steel under different processes of manipulation, that it would seem as if there must be some connection between the forces at work in the different cases, if, indeed, there be not an identity of force in all of the cases, of which magnetism, as we know it, is a mere visible manifestation which may serve as a guide to lead us to an exact knowledge of the structure, the strains and the resistances with which we have to deal so largely in iron and steel." He concluded by enumerating a number of reasons which in themselves, he argued, rendered investigation by means of magnetism justifiable.

The discussion was continued by Mr. Geo. Webb, of Johnstown, Pa.; Mr. William Kent, of Pittsburgh, all in opposition to Dr. Dudley.

John W. Cloud, of Altoona, and Professor Thomas Egleston, of New York, relieved the monotony of a continued opposition by siding with Dr. Dudley in the belief that the softer steel in rails gives the better wear. After remarks on the subject by O. A. Moses, of Menlo Park, N. J., S. Alfred Ford, of Pittsburgh, and Professor George Koenig, of Philadelphia, Dr. Dudley arose to defend his theory. After an exhaustive review of the opposing arguments he said: "I do not claim to have solved the problem of wear, as has been intimated here, and I have made no formula and stated that that must be the ultimatum. I have made certain tests and submitted the conclusions. If I have not gone far enough, we ought not to say because we cannot have the complete solution of the problem we will have none at all."

In conclusion, Dr. Dudley expressed the hope that the investigation would be continued, and that manufacturers and consumers would work hand in hand to obtain the desired results. After thanking Dr. Dudley for his able paper, the Institute adjourned for the morning.

At 3:30 o'clock the closing session of the meeting was opened with the reading of a paper on "The Whitwell Stove and Its Recent Improvements," by Frederick W. Gordon, of Pittsburgh. This was followed by an interesting paper on "Burnishing and Ductilizing Steel," by Jacob Reese, of Pittsburgh, which illustrated a new process of annealing bars of steel one inch in diameter at the rate of one foot a minute, as compared with the old method by which it required from five to twenty-four hours to anneal a bar of ordinary length. "The Brazos Coal Field in Texas" was next discussed by C. A. Ashburner, of Philadelphia. "The Brazos vein," he said, "runs about 120 feet below the surface, near Fort Belknap, Texas, and was only recently discovered. The stratum is anthracite, undulating for miles at a thickness of four feet, and combining pureness of quality with surroundings offering advantageous facilities of access for mining operations."

Professor George A. Koenig, of Philadelphia, followed with a paper on "The Occurrence of a Lustrous Coal in a Fissure Vein," and was succeeded by O. J. Heinrich, of Drifton, Pa., whose paper on The Mining School at Drifton was the last one submitted.

After the reading of the annual reports, the following officers were elected to serve the ensuing year: President, William Metcalf, Pittsburgh; Vice-Presidents, J. P. Kemble, Baltimore; W. H. Petty, Ann Arbor, Mich., and C. O. Thompson, Worcester, Mass.; Secretary, Dr. Thomas F. Drowne, Easton; Treasurer, T. D. Rand, Philadelphia; Managers, J. S. Alexander, Philadelphia; H. S. Monroe, New York, and J. C. F. Randolph, New York.

The following is the list of new members and associates, unanimously elected:

Wilham F. Biddle, Philadelphia, Pa.
A. T. Enos, Brooklyn, N. Y.
Henry Roberts, Johnstown, Pa.
J. Whitaker Wright, Denver, Colo.
Henry P. Cooper, Parryville, Pa.
A. J. Corey, Hancock, Mich.
L. G. Emerson " "
Ed. H. Lynde, Scranton, Pa.
O. A. Moses, Menlo Park, N. J.
E. C. Hegeler, Lasalle, Ill.
H. N. Brinsmade, Lake Mahopac, N. Y.
Lewis Stockett, Ashland, Schuylkill Co., Pa.
F. G. Clemens, Lost Creek P.O., Pa.
William H. Morris, Pottstown, Pa.
Alexander Thomas, Boston, Mass.
W. F. Robertson, Capelton, Quebec, Canada.
John L. Thompson, " " "
Orleans Longacre, Irontown, West Va.
John H. Clemes, Alamos, Sonora, Mexico.
T. H. Graham, Cancela, Coahuila, Mexico.
L. M. Hooper, School of Mines, N. Y. City.
C. B. Cohen, Salt Lake City, Utah.
Ferdinand Ruttmann, Brewster's Station, N. Y.
Jules Naville, San Miguel, Colo.
C. O. Lagerfelt, Reigelsville, Pa.
J. H. Hammond, San Francisco, Cal.
Charles O. Brown, U. S. Colombia, South America.
C. P. Sandberg, London, Eng.
S. G. Thomas, London, Eng.
Charles Kennedy, Springfield, Ill
Dr. F. V. Hayden, Philadelphia, Pa.
Prof. E. D. Cope, Philadelphia, Pa.
N. Allen Stockton, Philadelphia, Pa.
Henry S. Sterling, New York.
Washington Jones, Philadelphia, Pa.
William A. Leavitt, Philadelphia, Pa.
David B. Lewis, Vulcan, Mich.
George D. Bolton, Calumet, Mich.
Horace Brock, Lebanon, Pa.
Samuel Noble, Amiston, Ala.
Leslie Warner, Chattanooga, Tenn.
David Watts, Harrisburg, Pa.
George S. Comstock, Mechanicsburg, Pa.
Harry H. Campbell, Steelton, Pa.
E. C. Felton, Steelton, Pa.
John L. Kennedy, Rocky Mount, Pa.
S. M. Prevost, Harrisburg, Pa.
Spencer Meade, Harrisburg, Pa.
Charles E. Pugh, Altoona, Pa.
Robert E. Pettit, Altoona, Pa.
W. Lesley Sheafer, Pottsville, Pa
Joseph M. Knapp, New York.
E. C. Jewett, Leadville, Colo.
N. R. Wilson, " "
W. W. Culbertson, Ashland, Ky.
J. W. Revere, Boston, Mass.
Percival Roberts, Philadelphia, Pa.
F. P. Davis, Washington, D. C.
A. E. Foote, Philadelphia, Pa.
S. H. Chauvenet, Harrisburg, Pa.
A. Pluemer, Cincinnati, O.
J. C. Dods, Philadelphia, Pa.

ASSOCIATES.

Herman T. Vulte, New York.
N. B. Walker, "
William Lorenz, Jr., Lebanon, Pa.
J. Trowbridge Barley, Philadelphia, Pa.
Prof. John Meigs, Pottstown, Pa.
William A. Shepard, New York.
Henry E. Wilson, Memphis, Tenn.
C. W. Davenport, Lafayette College, Easton, Pa.
W. H. Emanuel, " " "
Hermann A. Keller, Philadelphia, Pa.
John H. Irwin, Morton, Delaware Co., Pa.

CONVENTION OF INDIANA SURVEYORS.

To the County Surveyor:

In pursuance of a circular, sent to every County Surveyor in the State of Indiana, by Walter A. Osmer, dated January 31, 1881, setting forth the *urgent* necessity of holding a convention of county surveyors, enough responses were made, among whom were the undersigned, and it is now proposed and understood that such a convention will be held for the purpose of forming an association, similar to those in nearly every other State (and which no county surveyor should fail to join) thereby promoting the interests of surveyor and land owner, and for the purpose of securing greater uniformity in practice and professional improvement. Also to take some action tending towards equalizing the fees of surveyor, and try to make them at least commensurate with the fees of other county officers for similar work. It is expected that some of our leading instrument makers will be represented and have samples of instruments, etc. Bring any question that may have arisen in your practice, that may be of interest. A collection of old and new instruments, chains, etc., would be of interest. A united action on our part is imperatively demanded, and which can but result in great benefits, professionally and financially. Therefore, it is greatly to your interest to be present. Let us once be united, and see what good may be accomplished. Therefore, you are expected to be present, and take part in the meeting, to be held in Mr. H. C. Fatout's office, County Surveyor of Marion County, in the new court house in Indianapolis, on Thursday, March 3, next, at 2 o'clock p. m. To facilitate matters, business will begin promptly at the hour named, by electing a temporary chairman and secretary, and appointing a committee on permanent organization. Again, we say, don't fail to be there.

WALTER A. OSMER. Cass County.
LEWIS S. ATLER, Jasper "
IRA MCCONNELL, Montgomery.
JAMES W. SHEA, Wabash County.
CALEB HUGHES, Kosciusko "
H. C. FATOUT, Marion "
OTIS SHEPARD, Newton "
F. H. POLK, Gibson "
JAMES H. BENNAN, Martin "
J. A. CLARK, Hendricks "
C. F. S. NEAL, Boone "
SILAS MILLER, Fulton "
JAS. C. PULSE, Decatur "
THOS. P. HARRIS, Madison "
R. H. WALLS, Putnam "
W. S. FRIES, Hancock "
J. J. LEONARD, Union "
R. J. MORRISON, Henry "
JEROME T. BRUNCE, Pulaski "
W. H. GOSHORN, Allen "
GEO. INGELS, JR., Howard "
A. R. ORTON, White "
F. M. PARKER, Greene "
ROBT. P. MAYFIELD, Knox "

THE MEXICAN RAILROADS.

It is a common error to say the Santa Fe road is being built into Mexico. It is not. Another combination, of which Thomas Nickerson, the President of several Kansas railways, is President, is building the Mexican roads. He is backed by many of the Boston capitalists who are behind the Atchison, Topeka & Santa Fe and the Chicago, Burlington & Quincy. In fact, the Chicago, Burlington & Quincy, Santa Fe and Mexican Central are a trinity of roads inspired by the same people who live in Boston, but each road distinct from the other.

A few days ago I had a talk with H. C. Nutt, who is manager of the Mexican Central road, which is to run from El Paso through Chihuahua to the City of Mexico, with a branch to Guaymas, on the Gulf of California.

"We have already laid," said Col. Nutt, "forty miles of track northward from the City of Mexico and twenty miles southward from Guaymas. Ten thousand tons of steel rails are on their way from England now to be landed at Guaymas. The Mexican roads are to be built of English material to save duty. The steel rails to build the Mexican Railroad will be bought in Montreal for $25 per ton, and shipped through the States in bond. The same steel rails, if bought in Pennsylvania, would cost $50 per ton. It is 259 miles from El Paso to Chihuahua, and about 750 miles from there to the City of Mexico. We propose to have the entire line completed in two years."

When I asked Col. Nutt about the wealth of Mexico, he said:

"Our road will pass through fertile valleys loaded with agricultural wealth, and by mines which were worked out by hand by the Spaniards two hundred years ago. Mexico will be the Spain of the American continent. Around Chihuahua they raise wine equal to the best Sauterne. Grapes for making champagne as good as the best Piper Heidsick grow in abundance here. The mines are so rich that it will even pay to rework the 'tailings' of the old mines. I passed over the entire line, and was myself astounded at the smothered wealth of the country."

"How do the Mexicans look upon the new projects?" I asked.

"They have suddenly awakened from a long sleep, and are becoming very enthusiastic, especially the best classes. The Mexicans are a good deal like the Chinese. Labor is poorly paid, and there is not not enough of it to keep the people in Mexico busy. In Guaymas they even carry water by hand, and will not permit its drayage through the streets for fear it will harm the working classes. But the building of 2,000 miles of new railroad in Mexico will occupy all her surplus labor. An epoch of activity and prosperity is dawning on Mexico, and the educated classes see it."

"What do the farmers raise in Mexico?"

"Everything from wheat to cotton and bananas. Four hundred miles north of Mexico is the best cotton country in the world, and the Mexicans have been raising it and hauling it in ox-carts for 400 and 500 miles for years. The Mexican Central," says Col. Nutt, "will be built in two divisions. The Northern Division will run from Chihuahua to El Paso, and the Southern Division from Mexico to Chihuahua. The line from Florida Point to Guaymas will be a branch internally connected with the Santa Fe. The same capitalists will be behind both roads."

"What is the financial status of the Mexican Central?" was asked of Mr. Alden Speare, who, with Messrs. Forbes and Coolidge, of Boston, owns a controlling interest in the Atchison, Topeka & Santa Fe Road.

"The finances for the Mexican roads are provided for. We ask no appropriation. The bonds are all disposed of."

"Any New York railroad men interested?" I asked.

"Yes; Mr. Jay Gould has $3,000,000 worth of bonds. We had to give him this interest to prevent his building a rival line."

OTHER MEXICAN ROADS.

The Mexican newspapers are filed with railroad notes and news. A railroad mania seems to have broken out all over the republic. The *Diario Official*, published in the City of Mexico, Dec. 29, speaks of the work on the Matamoras & Monterey Railroad as being pushed with vigor. Here are other items:

"Mr. Jose M. Amot is building a road from Taluca to Ixtapa del Oro."

"Twenty kilometres of the road from Tilancingo to Pachuca have been completed by English capitalists."

"The State of Campeche has commenced building a railroad from the Capital of that State to Calkini, with branches to Lerma."

The *Diario Official* speaks of a dozen different roads being built besides the above.

GOULD'S AND GRANT'S MEXICAN LINE.

The line from San Antonio to Laredo, on the Rio Grande River, and from thence across Mexico to Mazatlan, is the line that Gould, Gen. Grant, and the wealthy syndicate just formed will build. The Mexican part of the line has been surveyed once by the Mexican Government. This will be Gould's outlet for the Iron Mountain and Missouri, Kansas & Texas road. Gould will build 450 miles of new road in Texas next spring. He has already ordered 50,000 tons of steel rails and 8,000 tons of iron rails for his Missouri and Texas extension. Gould's Mexican road will be 750 miles long from Laredo to Mazatlan. This will be the Mexican end of Gould's Missouri, Kansas & Texas and Iron Mountain railroads.

Mr. Pierce's "Sunset" road is already completed from Galveston, through Houston and on to San Antonio, Tex. This road is also connected with New Orleans. Pierce and Gould are now building northwest of San Antonio toward Eagle Pass, on the Rio Grande River. From Eagle Pass this road will run up northward toward El Paso, making a continuous line from New Orleans to San Francisco. It is safe to say that 2,500 miles of new road will be built in Texas and Mexico next summer.—*Eli Perkins in Chicago Tribune.*

RAILROAD BEGINNINGS.

Among the first improvements made on the ordinary road was the placing of sleepers side by side, making a wooden road-bed, similar to that in common use now in many countries and well-known here as the corduroy road. At New Castle-upon-Tyne, a man named Beaumont, a heavy coal-dealer, some time before 1650, constructed a wooden roadway at his mines; at least twenty-five years later, a roadway was described which is supposed to be like that built by Mr. Beaumont. It consisted simply of wooden rails six or seven inches wide, fastened to sleepers five or six feet apart by wooden pegs. On these the heavy carts with clumsy wheels were pushed or drawn along. A horse would draw a load of about two tons on one of these railroads, under favorable circumstances. As a rule the collieries were situated at a higher level than the depots, so that the grade was generally favorable to the loaded cart. As the rails were found to bend, and to offer a corresponding resistance to the wheels, the plan was adopted in some cases of nailing plates of iron to the surface of the wooden rails. Canals at this time were receiving the most attention from those interested in improving the means of internal communication, and but little interest was expended on the railroads through a period of many years, the attention of scientific men being turned in other directions.

An idea of the little attention that was given to the railroad in those early days of its history is seen from the fact that about a century passed

after the time of nailing strips of iron to the rails before the next important improvement was made, that of substituting cast iron for wooden rails. Mr. Stephenson puts the first manufacture of iron rails as occurring in 1767, at the extensive iron works of Colebrook-dale in Shropshire. Iron wheels were used to some extent ten or fifteen years before. The first railroad with iron rails is said to have been constructed at the Duke of Norfolk's colliery Sheffield. About the year 1810 malleable iron rails were first introduced at the coal works of Lord Carlisle, on Tindale Fell, Cumberland. Mr. John Birkinshaw obtained a patent in 1820 for a new form of malleable iron rails, one feature of which was their increased length over those formerly used; the first malleable iron rails being made in the form of bars about two or three feet long, while those improved by Mr. Birkinshaw were made from twelve to fifteen feet in length. In 1817 a queer invention was patented by Mr. John Hawks, of Gateshead, consisting of a rail made of both cast and malleable iron. The rail was made of a bar of malleable iron having cast iron run upon its grooved surface in a state of fusion. The difficulty found in manufacturing them prevented the general use of the rails, though there were undoubtedly good ideas embodied in the principle.

The cars, or "wagons," as they were called, of those early days of the railroad, were as crude and clumsy in their form as the rough play carts of children portrayed in pictures of ancient rural life. Being intended for the carrying of coal, the cars of that time were adapted in form for that purpose, and were made of roughly joined wood in the shape of hoppers. Previous to about 1750 only wooden wheels were used. The front wheels were made of larger diameter than the rear wheels to keep the body of the car horizontal on the downward grade, the roads being intended chiefly to bring loads down from the mines to the coal yards and depots. These wheels were sometimes made of one piece, but oftener of several pieces fastened together by wooden pins. The surface was hewn out to fit to the rail. About the middle of the eighteenth century cast iron wheels began to appear, and for a time it was customary to have two of the wheels on a car of iron and the other two of wood. There was a strong prejudice against the use of iron wheels on account of their injury to the rails, the danger of their cracking and the rude brakes not working on them satisfactorily, and it was for the latter reason, probably, that during the introduction of the cast iron wheels, wooden wheels were used with them on the same car. The adoption of iron rails did away with the use of wooden wheels—*Railroad Journal.*

NOTE.

INVENTION OF THE TELEPHONE.

Counsel for the People's Telephone Company, of New York, filed in the patent office at Washington, on the 25th ult., a brief, giving their side of the application of Daniel Drawbaugh for a patent for a telephone. It contains the following statements: The first telephone patent was granted in 1876, and since then the patents of Gray, Edison and Bell, with the Blake transmitter, have been consolidated into what is known as the Bell American Telephone Company. The stock was originally sold at $50 a share, and afterward was quoted and sold as high as $1,000 a share. The stock has been watered since, and the company is now in the market borrowing money. No dividend has ever been paid. The company has made and is making immense sums of money, but all this and the money it is borrowing has gone into the plant, which rapidly increases in extent and value, and the original stock is probably now worth $1,000 a share or more. It spent a large sum of money, too, in buying patents for improvements on the instruments. This is the only existing telephone in operation. The People's Telephone Company, against which the Bell company has a suit in the United States Circuit Court in New York, is composed of a number of gentlemen who have formed a company and purchased the interest of Mrs. Daniel Drawbaugh, of Eberty's Mills, Cumberland County, Pa. Mr. Drawbaugh, as is proved by about 100 living witnesses, neighbors and others, invented and had in practical operation a speaking telephone in 1870–71–72–73–74, the result of an acknowledged invention of his in 1868. He was very poor, in debt, with a large and helpless family depending upon him for support, and was, from this cause, unable to patent or caveat his invention, or manufacture or market it, and it is claimed that he never abandoned his claim to his invention to anybody. The men composing the People's Telephone Company bought his claim and some patents that completed the instrument, and made application for Mr. Drawbaugh in 1880 and proposed to furnish telephones for about one-third the cost of the Bell telephone. Presuming upon the validity of their claim, they pooled the company's stock, spent about $50,000 and started in the beginning of the work with plently of capital to go ahead on. The originators were wild with great hopes, but the Bell company caused an injunction and suit. The best of lawyers were engaged on both sides, and the Drawbaugh patent was rejected about two months ago on the grounds that patents had been granted to others, and printed descriptions published by others prior to the date of Mr. Drawbaugh's application and that telephones were in use more than two years before Mr. Drawbaugh's application. The hearing process now comes in by the doings of to-day, and is presented on three questions of law: First, the defendants claim that an application is not barred by a patent granted, or description published, more than two years before the application, provided the applicant's invention was prior to the patent or printed publication; second, that the application of the first inventor is not barred by a two years' public use or sale of another man's subsequent invention, without the consent or allowance of the first inventor, except under such circumstances as prove a voluntary abandonment of the invention to the public; third, that the Commissioners of Patents cannot lawfully allow anybody to contest the application except by interference proceedings. These points are upheld by high legal authority and pointed judicial decisions, and the belief is that either Drawbaugh will get a patent or the invention be given to the public.

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

Cheboygan, Wis., has been having a survey made, with a view to constructing water-works. The cost is estimated at $25,000.

The Hartford reservoirs, with a capacity of 1,200,000,000 gallons, have less than 500,000,000 gallons, notwithstanding the recent thaw, and require some heavy rain-falls to prevent a water famine next summer.

The reservoirs of the Carlisle, Pa., water-works are empty, and the citizens are greatly alarmed. The authorities assert that the pumps have been run constantly, but that the loss was occasioned by the citizens permitting the water to run from the pipes to prevent their freezing.

ELECTRICITY.

The city of London is about to try electric lighting. Acting on the report of their engineer, Colonel Haywood, the Jablochkoff system was tested on Holborn Viaduct from Dec. 14, 1878, to March 9, 1879. During that period sixteen electric lamps were used in place of eighty-six ordinary lamps, fourteen being placed at equal intervals on either side of 473 yards of street, and one lamp at each end of this distance in the middle of the roadway. Each lamp illuminated about 888 yards superficially, and was kept burning seven hours per night at a cost of 6s. 3d. No exact photometrical observations were made by the Commissioners during this experiment, because the Metropolitan Board of Works were conducting simultaneously the electric lighting of the Thames Embankment, under exactly similar conditions, and the scientific officers of the Board came to the conclusion that the illuminating power of the light, when unenclosed, was about five times that of ordinary gas, and when inclosed in the opal globes used on the Viaduct about twice as much, while the actual cost was nearly four times as much as gas. The companies have greatly reduced the cost of producing the light since then, and of course made it a more formidable competitor with gas. Under these fresh conditions the Commissioners of Sewers have decided to try the Jablochkoff, the Brush, and the Siemens systems. The first will be applied to Southwark Bridge, Queen Victoria street, and part of Queen street; the second to New Bridge street, Ludgate Circus, Ludgate Hill, the north side of St. Paul's churchyard, and thence along Cheapside as far as King street; and the third to the remainder of Cheapside, the Poultry, King street, Guildhall Yard, Mansion House street, King William street, and London Bridge. The contract price is £2,930 for the Jablochkoff; £1,410 for the Brush, and £3,720 for the Siemens districts.—*Architect.*

STREETS, DRAINAGE, ETC.

Messrs. Johnson & Wilson, 93 Liberty street, New York, have booked contract order from the Edgar Thomson Steel Company, limited, of Pittsburgh, Pa., for 7,000 barrels "Saylor's" Portland cement, to be delivered through the season of 1881, and to be used in the construction of their new plant at Bessemer Station, Pennsylvania R.R. This cement company are about doubling their present capacity.

BRIDGES.

The New York, Pennsylvania & Ohio Company will rebuild 16 of their bridges on the third division in the spring.

One of the most serious losses by the recent heavy rains is the bridge over the Wabash Railroad, at Sullivan, Ill., estimated at $175,000.

The Canada Southern Railway Company is about to erect a temporary bridge at Monroe, to be used until a new iron structure can be put up in place of the bridge washed away by the recent freshet.

The contract for the bridge over French Creek, in the city of Meadville, Pa., for the Meadville Railway, together with substructure for same, has been let to G. W. White, of Pulaski, N. Y., which will be begun at once. The bridge in question will be a Howe truss, in three spans of about 100 feet each, and will cost, with substructure, about $14,000.

RAILROADS.

Berlin's electric railway, built by Siemens & Halske, which runs between Berlin and a suburban village, is the first electrical railway built for actual use.

The Tuscarawas Valley Railroad offers to build a line from Russell station to Wooster, about 12 miles, for $50,000, giving Wooster a direct outlet to Cleveland.

The Pacific Mail Railroad Company have completed arrangements to build a new elevator at Omaha with a capacity of 600,000 bushels in time for the next season's crop.

VICTORIA, B. C., Feb. 22.—Mr. Onderdonk, contractor of the Canada Pacific Railway, advertises that he will want 3,000 white laborers during the coming summer.

A correspondent writes us from Tula, Mexico, Feb. 5, that the Mexican Central Railway Company are "rushing things," having 36 miles of track laid and employing over 10,500 men in construction.

Work has been suspended on the first 100 miles of the Canada Pacific Railway west, and most of the men have returned to Winnipeg. It is believed the suspension is but temporary. The greater portion of the men expect to be re-engaged under the syndicate.

The Duponts, of powder-manufacturing fame, have bought the entire capital stock of the Delaware Shore Railroad, from Woodbury, N. J., to Penn's Grove, just opposite Wilmington, for less than 20 per cent. of its par value. The capital stock is nearly $75,000 and the bonded debt $50,000, held by the Fidelity Trust Company.

The Chicago, Milwaukee & St. Paul Company have adopted a new freight brake, that acts as powerfully and instantaneously as the Westinghouse brake on passenger cars. This brake does away with the dangerous necessity of running over the tops of the cars; it stops the train instantly, and is very cheap, only costing from $12 to $15 per car.

The Delaware, Lackawanna & Western Railroad engineers are still prosecuting their work in the vicinity of Bath, N. Y. The proposed track will be laid on the south side of the Erie road, and will run close to the Soldier's Home. Another party of engineers of the same road are surveying at Lancaster. The proposed line is to cross that town north of the New York Central tracks, and will, therefore, be some distance from the village.

The Wabash, St. Louis & Pacific is at present making a survey for an extension of their road to Alton, Ill., which will probably be built. The Chicago, Alton & St. Louis is going to build a cut-off around Alton, for a double track; the track through that city is 85 feet to the mile; by making a cut-off they can extend the distance, giving 30 per mile. The contract has been awarded to Wolf & Sons, Ottumwa, Ia., and work will be commenced as soon as frost is out of the ground.

There was filed for record in the Recorder's office at Chicago last week articles of consolidation between the Chicago & Milwaukee Railway Company and the Northwestern Union Railway Company. The Board of Directors are Albert Keep, Marshall M. Kirkman, Martin L. Sykes, Augustus Schell, Marvin Hughitt, Joseph B. Redfield, William L. Scott, Charles C. Wheeler and James H. Howe, to hold their office until their successors are duly elected and qualified.

A NEW MOUNTAIN LINE.—The directors of the Union Pacific, at a meeting held a few days ago, decided to build, with all practicable dispatch, a broad-gauge railway, commencing at Denver and extending by a direct line through the coal fields of Boulder County to Longmont, and from Fort Collins up to Cache la Poudre into the North park, thence into Middle Park, via Muddy Creek, tapping the new mining camp at Lead Mountain. Several engineering parties are now engaged locating this line, and some five different camps of graders have been established in the Cache la Poudre cañon, and are now at work on the grade at several points. This cañon resembles somewhat the Clear Creek cañon, up which the Colorado Central road now runs, though it is more open. This road is being built under the charter of the "Greeley, Salt Lake & Pacific Railway Company."

The directors of the Canada Pacific Railway met at the company's office in Montreal on the 17th, when the $5,000,000 worth of stock required to be subscribed by the terms of the charter was immediately subscribed and 30 per cent. thereof paid in, and $1,000,000 required to be paid to the Government as security for the performance of the contract was deposited in the Bank of Mon-

treal to the credit of the Finance Minister at Ottawa. The company was fully organized by the appointment of George Stephen, of Montreal, as President; Duncan McIntyre, of Montreal, as Vice-President; J. J. C. Abbott, Q. C., M. P., as Counsel; Messrs. Stephen, McIntyre, Angus and Hill as the Executive Committee; Charles Drinkwater as Secretary and Treasurer, and A. B. Stickney as General Superintendent of the Western Division. Arrangements were made for the work of construction. The next meeting of the directors will be held in London three weeks hence.

The following is a summary of the new tracks laid in Iowa in 1880. The list comprises track exclusive of second tracks or sidings:

Burlington & Northwestern (three feet) ex Crawfordsville northwest to Washington	10
Burlington, Cedar Rapids & Northern	71
Chicago & Northwestern	84
Chicago, Burlington & Quincy	35¾
Chicago, Milwaukee & St. Paul	42¾
Chicago, Rock Island & Pacific	50
Dubuque & Dakota, ex. Waverley, east to Sumner	23
Keokuk & Northwestern, Keokuk northwest to Salem	37
Minneapolis & St. Louis	48
Wabash, St. Louis & Pacific—	
Missouri, Iowa & Nebraska, ex Corydon west to Van Vert	30
Missouri, Iowa & Nebraska, Albia Branch, Centreville north to Albia	26
Total	458¾

At the head of the States stands Ohio with its round 500 miles of new road, and next comes Iowa with 456¾ miles. Illinois falls below with 392¼. The Territory of Dakota constructed 724 miles, and that of New Mexico 540¼.

Boston capital and Yankee "pluck" have built a road through the centre of New Mexico down the Rio Grande, to within fifty miles of the Mexican boundary. The success of the construction is due in every respect to the careful inspection and the "get-up-and-get" of A. A. Robinson, the Chief Engineer, who is straining every nerve to complete the road for through traffic to the Pacific this spring. On the 1st of March the road will be finished to El Paso, and connect at Deming with the Southern Pacific, completing the second great transcontinental route to San Francisco. The whole territory is in a fever of excitement, anxiously waiting for the road to run into El Paso, and many of our own citizens here in Vegas are ready to pull up stakes and move down as soon as the boom commences. El Paso del Norte is on the Mexican side of the Rio Grande. Franklin, across the river in Texas, the terminus of the R. G., M. & P., is generally known by the same name and spoken of as El Paso. The company has already located its depots. Businessmen are on the ground buying up town lots and getting ready for the boom. It will be a lively town for a while. We can look for the lawlessness and depredations which are always found in a new frontier town. Those Texas cow-boys will make things lively for El Paso as the bull-whackers of the Panhandle used to do in the palmy days of Otero and El Moro. These Mexicans are a peculiar race. They dread the approach of Americans, which means work or starve. If the Americans should all leave to-morrow, the natives would all settle back into the old ruts, and live on "tortillas" and "chili colorado" till Gabriel blows his horn. The burro and the native are inseparable. Where you find one, look for the other. To judge from appearance, they are fit companions. A burro won't travel faster than a walk, and his driver would rather have him stop altogether. These Mexicans have great confidence in the linguistic abilities of their asinine compadres; for they say in great derision to an American "Sabe el burro?" which means, even a jackass can understand Spanish. The above is a standing joke among the aborigines, and they never miss an opportunity of offering it free of charge.—*Chicago Tribune.*

NEW PROJECTS.

The Butchtel Iron Company, the stockholders of which are Boston men, has been incorporated at Columbus, Ohio. Capital, $2,500,000.

The Chicago & Grand Trunk Railroad, lying between Port Huron and Chicago, has passed into the management of the Grand Trunk Railroad.

A contract has been made at Des Moines with the chief engineer of the Des Moines & Kansas City Railroad, and the work begins at once of the survey and location of the road.

The Brush Illuminating Company, New York, which is to have a capital stock of $1,000,000 divided into $10,000 shares, and is to be managed by twelve trustees headed by W. M. L. Strong.

CLEVELAND, O., Feb. 25.—Financial arrangements have just been made for the immediate completion of the railroad between Canton and Coshocton in Ohio, a distance of sixty miles.

QUEBEC, Feb. 21.—A cable dispatch has been received authorizing the immediate construction of a beet root sugar factory at Berthier, on behalf of the Union Sucriere of Paris. This will be the first of the kind in the Province of Quebec.

DETROIT, Mich., Feb. 15.—An incorporated company, to be known as the Edison Electric Light Company, with a capital stock of $500,000, filed articles of association here to-day. The list of stockholders embraces many of the wealthiest men in the city.

A joint stock company has been formed to run a line of steamers between Brazil and Halifax in winter and Brazil and Montreal in the summer. The company will probably receive subsidies from the Canadian and Brazilian governments.

Johnston Livingstone, William R. Dodge and others have filed articles of incorporation as trustees of the American Heating Power Company, with a capital of $6,000,000. The company is to supply hot air or steam for motive power and other purposes in New York.

The bill to incorporate the Cherokee & Arkansas Railroad Company, which proposes to build a road from Arkansas City, Kan., along the Arkansas and through the Indian Territory to Fort Smith, Ark., will be reported in the Senate shortly. The bill passed the House on the 1st inst.

It is reported in Philadelphia that subscription-books will be opened in June next for the stock of a new company that will undertake to build a ship canal between the Chesapeake and Delaware bays. The stock will be $15,000,000, in shares of $100 each. The canal is to be 26 feet deep, 125 feet wide at the top and 100 feet at the bottom—possibly 200 feet wide at the top and 125 feet at the bottom.

The Greeley, Bear River & Pacific Railway and Telegraph Company has filed articles of incorporation at the office of the Secretary of State of Colorado, the incorporators being Elmus Smith, Charles C. Welch, Abijah G. Smith, John G. Bush and D. S. Markle, of Colorado. The capital stock of the company is $500,000, divided into 5,000 shares of $100 each. The principal offices of the company are to be at the Fort Collins and Golden.

PANAMA, Feb. 15.—The engineers sent here by M. de Lesseps have not yet begun work on the canal. Proper quarters to live in are being put up. A year will be occupied, it is thought, in the final surveys, clearing up the country and preparing for the introduction of dredging machines, steam shovels, drills, etc. The advent of the new comers shows the poverty of the local markets. Meats, vegetables, everything eatable is almost at famine prices, and the supply is not equal to the demand.

A Fargo dispatch says: "A railroad company was organized at Moorhead on the 16th. The road will run from Moorhead to Breckenridge. It will be called the Moorhead, McCauleyville & Breckenridge Railroad. First Board of Directors: A. A. White, S. G. Comstock, F. J. Boomham and John Erickson, all of Moorhead; Messrs. McCauley and Harris, of McCauleyville; Messrs. Hanson and Brandrup, of Breckenridge. Work is to commence as soon as the weather will allow."

OTTAWA, Feb. 21.—The Senate has amended the act to incorporate the European, American and Canadian Cable Company (Limited) so as to restrict the rate to be charged to fifty cents per word on every message sent over the company's wires from the point where the message is received in Canada, as far west as Ontario, to any point in Great Britain and Ireland, or vice versa. Among those who have petitioned in favor of the bill is Lord Walter Campbell, the brother of the Governor-General.

Articles of association of the Toledo, Cincinnati & St. Louis Railroad were filed in the office of the Secretary of State of Indiana Feb. 14. It is to run from the State line between Ohio and Indiana, in Adams, to the State line, between Indiana and Illinois, in Vermillion County, a distance of 175 miles, in Indiana, and is the extension of the Toledo, Delphos & Burlington Railway. Capital stock, $3,000,000. The Board of Directors are Geo. Wm. Ballou, Eli Marvin, C. H. Vennor, W. J. Craig, John M. Corse, W. H. Hart and Wm. H. Bingham.

Articles incorporating the New York, Lackawanna & Western Railway Company were filed on the 17th. The lines are to begin in Binghamton, run through the counties of Broome, Tioga, Chemung, Steuben, Livingston, Wyoming and Erie to Buffalo, and thence to the Niagara River, connecting at the Suspension Bridge, with a branch through the counties of Livingston and Monroe to Rochester. The estimated length is 300 miles, and the capital is placed at $10,000,000. Samuel Sloan, E. S. Higgins, George Bliss and others are directors.

MONTREAL, Feb. 21.—Professor Bell, who has been in the Northwest and Hudson Bay, arrived from England a few days ago, and is hard at work upon reports wanted by government as to the navigation of Hudson Bay. He says that with a railway from the York Factory to Churchill, Northwest, grain can be laid down in Liverpool cheaper by the Hudson Bay route that it can be in Montreal City by the all-rail route of the Canada Pacific Railway. He says steamers can navigate Hudson Bay and Straits easily from the middle of May to the middle of October.

Articles of association of the Brazil & Chicago Air-Line road, to run from Brazil, Clay County, to Rensselaer, Jasper County, were filed February 18 in the office of the Secretary of State of Indiana. The capital stock is fixed at $500,000, divided into 5,000 shares of $100 each. It is to run through Clay, Park, Fountain, Warren, Benton and Jasper counties. The length is to be about one hundred miles. The directors are Hiram Liter, Thomas Watson, William B. Zimmerman, Ensign Bennett, W. M. Redpath, Donald B. McCrimmon and Dillon W. Bridges.

MEXICO, Feb. 16.—It is reported that Messrs. Palmer and Sullivan propose to construct a narrow-gauge railroad from the City of Mexico to Vera Cruz without subvention. It is supposed the government disapproves the building by American companies of any railways in competition with those now under contract. Trustworthy information has been received that Mr. Sullivan has bought the Corpus Christi & Laredo Railroad, paying cash therefor. Robert R. Symon, as agent, has caused the transfer to Edward D. Adams, of New York, of the concession for a railroad from Altata, State of Sinaloa, to Cuhacan and Durango.

There has been filed with the Secretary of State of Kansas the charter of the Kansas, Arizona & Pacific Railroad Company. The incorporators and directors are: A. A. Talmage, James A. Hill, Charles G. Warner, Thomas J. Portis, S. T. Emerson and Charles M. Hays, of St. Louis; Alfred Ennis of Topeka; William Spriggs and W. A. Johnson, of Garnett, Kan., all connected with the Missouri Pacific Railroad, for which the new line is designed for a feeder. The capital stock is $10,000,000. The proposed route is from Leroy, Coffey County, running in a southwesterly direction through the counties of Coffey, Woodson, Greenwood, Butler, Sedgwick, Kingman, Horner, Barbour, Comanche, Clarke, Mead and Seward, to the west line of the State, a distance of 400 miles. The business of the new corporation is to be transacted at Leroy, Ossawatomie or Wichita, Kan., and it is said the work of construction will be pushed with all possible speed.

Articles of incorporation of the Colorado & Pacific Railroad Company, with a capital stock of $12,000,000, divided into 120,000 shares of $100 each, have been filed with the Colorado Secretary of State. The directors for the first year are James T. Briggs, Henry J. Chase, C. W. Wright, Norris H. Cone and John F. Degnon. This road and its branches, according to the terms of its articles, will run into or through the counties of Pueblo, Ouray, Custer, Costilla, Saguache, Gunnison, Rio Grande and Hinsdale, in which counties the business of the company is to be conducted, with the privilege of extension into Utah. The road is to have several branches: The Rio Grande Branch, the Gunnison Branch, the Lake City Branch, and the Ouray Branch. The construction company for this road also filed articles, with a capital stock of $1,000,000. The directors are Charles W. Tankersley, John W. Jenkins and Henry Ford.

ALBANY, Feb. 23.—The articles of association of the Mohawk & Lake Erie Railway Company, with Wm. Foster, Jr., E. C. Benedict, Henry J. Davison, George Lewis, Jr., H. S. Winans, E. F. Bacon, Enos Wilder, of New York; Wm. L. Burt, George L. Ward, Estes Howe, of Boston; W. W. Sheed of New Jersey; William V. Reynolds, of Schaghticoke, and John L. Wellington, of Eagle Bridge, as directors, were filed to-day. The road is to be constructed from Syracuse to Buffalo and to the International Bridge, with a connection with Rochester. The distance is 140 miles. The capital stock is $10,000,000, divided into shares of $100 each, and the company is to continue for 100 years.

There were filed also the articles of the Hoosac Tunnel & Saratoga Railroad. The road will be from Troy to Saratoga Springs. The entire road will be forty miles long. The capital stock is $2,000,000, divided into shares of $100 each. The same parties named for the "Mohawk & Lake Erie road" are to be the directors.

The Lake Superior & Southeastern is the name of a new Wisconsin railroad corporation to which a patent has been issued, whose purpose is to construct a railroad from Superior City, on the west end of Lake Superior, through Douglas, Bennett, Baum and Chippewa counties, via Chippewa Falls to Eau Claire, thence either through the counties of Dunn and Buffalo to the mouth of the Chippewa River, or through the counties of Pepin and Trempealeau to La Crosse, or possibly touching both points. The length of the line is some two hundred miles. The corporators are W. A. Rush, Governor J. M. Bingham, J. A. Taylor, George C. Ginte and L. C. Stanley, manager of the Chippewa Falls & Western Railway Company. This company has a bill pending before the Legislature asking that the portion of the grant of land by Congress to aid in the construction of railroads granted in 1874 to the Chicago Air Line Pacific Railway Company, and which that company has failed to earn, may be granted to it.

PHILADELPHIA, Feb. 17.—An immense transaction involving the reclamation of 12,000,000 acres of land, or one-third of one of the States of the Union, has been undertaken by a company of this city. About one-third of the State of Florida is a huge swamp termed "The Everglades," a dark, impenetrable, unknown region. No white man has ever fully explored it, and all that is known of it is that it is a great swamp with a number of lakes, and here and there islands, upon which roam wild beasts, but withal a place of wonderfully luxuriant vegetation. On its outskirts a few miserable human beings, a mongrel race of white, Indian and negro blood, manage to exist in a state of barbarism. These are the descendants of the unconquered Creeks and Seminoles who retreated to the fastnesses of the swamp before the United States army. The project of reclaiming this region has been talked of for years, and it has long been considered feasible by many eminent engineers. Under a contract with the State of Florida a Philadelphia company is about undertaking this great scheme. The leading man in the enterprise is Hamilton Disston, a young gentleman of energy and ample fortune and the head of the saw manufacturing firm of Henry Disston & Sons. Associated with him are ex-Sheriff William H. Wright, W. C. Parsons, Whitman H. Drake, A. B. Linderman, all of this city; I. Coryell, of Florida, and several others. Under the agreement already made with the State the company is required to begin surveys within sixty days, and within six months to put a force equal to 100 men at work, and continue the work until the land is reclaimed. It is proposed to drain the land by a canal from Lake Okeechobee to the Caloosakatchee River, which empties into the Gulf of Mexico. Another canal may also be constructed to the east, tapping the St. Lucie River which flows into the Atlantic. These canals will entirely drain the swamp and from 10,000,000 to 12,000,000 acres of the richest land in the world will be reclaimed. The company will receive for the work one-half of the land recovered, and it is expected that this will repay all expenditure of money which may be made in the work.